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Frontispiece
Annals of Medical History
May, 1935

University of Padua, Main Entrance with the Lion of San Marco on the Door

[From Schurigio: Lithologia Historico-Medica, Dresden, 1744.]

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DR. BENJAMIN WINSLOW DUDLEY*

By WALLER O. BULLOCK, M.D.

LEXINGTON, KY.

FAMILY tradition has it that towards the end of the war of the Revolution a company of Colonial troops was stationed in the little town of Fredericksburg on the Rappahannock. The young captain of his company, whose home was in the country nearby, on hearing Baptist Parson Lewis Craig preaching from behind the bars of his prison—he was not licensed by the state—became converted, was baptized in the presence of his troops, resigned his commission and devoted the remainder of his life to the saving of souls.

Young Captain Ambrose Dudley, from now on Baptist Parson Dudley, and Parson Craig remained forever strong friends and there is reason to believe that the influence of Craig had much to do with Brother Ambrose's migration to Kentucky.

When Craig led his traveling church of 500 members from their homes in Spottsylvania County (Virginia) over the Cumberland Mountains into Kentucky, Ambrose was on hand to bid them God speed, and five years later (March, 1786) he himself with family of wife and seven children, slaves, livestock and household goods, took up the now well worn "trace" through Cumberland Gap, and arrived at his destination in Kentucky in May, nearly two months later.

Benjamin Winslow, the seventh child of Ambrose and Annie Parker Dudley, first began to "inhale the slow poison that surrounds our planet" on April 12, 1785. He was, therefore, not quite a year old when his parents took him away from their old Virginia farm. He learned to walk while crossing the Cumberlands.

Of his childhood and early schooling, nothing is known, but being one of the large class of famous men whose fathers ministered to the souls of men, it is to be inferred that the Parson shared with Benjamin his stock of knowledge. Transmitted to him likewise by his father was the quality of leadership, for it has been said that the Parson ruled his flock of "Particular Baptists" at Bryan Station with no gentle hand.

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* Read before the John Bradford Society, April 4, 1934.

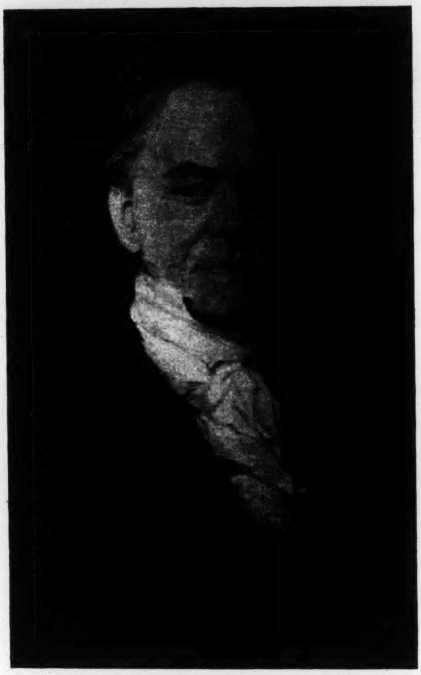

FIG. 1. BENJAMIN WINSLOW DUDLEY (1785–1870).

Of the schools in the wilderness at this period his contemporary Daniel Drake has given a pitifully accurate picture,* but they did possess one signal advantage: they eliminated quickly all but those determined to learn. In 1797 the Parson moved to Lexington; here Benjamin had a better chance to learn his three R's.

A young Marylander had just finished his tutelage under a worthy practitioner of Delaware when the Revolutionary War broke out. Attaching himself to a company of volunteers he enlisted and continued throughout the war serving as an army surgeon. Returning to his native state he began to practice his profession when the western urge struck him. So in 1790 we find Dr. Frederick Ridgely among the early doctors of Lexington where he continued to practice until 1822 except for the period when as Surgeon General he served with General Wayne in his successful campaign against the Indians. He was one of the first two teachers of Transylvania Medical Department (1799).

After completing his schooling, such as it was, and serving for a time as clerk in Trotter's store the Parson placed Benjamin Winslow in the office of Dr. Ridgely to learn what he could from him. How long this period of apprenticeship continued is not known, but it was long enough to establish lasting relations of mutual respect and friendship. In 1803 we find Dudley, while under the preceptorship of Dr. Ridgely, recorded as a member of the Lexington Medical Society.

In the fall of 1804 we find him matriculated in the Medical School of the University of Pennsylvania in Philadelphia. Among the students there at that session were three men, Drake, Richardson and Cook, who were later to be associated with him at Transylvania. On his return to Lexington in the spring of 1805 Dudley entered the office of Dr. James Fishback, a versatile doctor, lawyer, writer and preacher, who was also at one time one of Transylvania's medical teachers. Returning to Philadelphia in the fall he completed his course and received his degree of Doctor of Medicine the following March. Hampered by defective schooling there is nothing to indicate that at this period he was in any way above the average; nor is there any evidence that he was impressed by his medical teachers.

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* Pioneer Life in Kentucky by Daniel Drake.

Returning again to Lexington in the latter part of March, 1806, just two weeks before his twenty-first birthday, Dudley entered into the practice of medicine and while (from his ledger) he seems to have done fairly well, he was not satisfied.

In 1809 Transylvania made an effort to establish a complete course in Medicine and Dudley was given the chair of Anatomy and Physiology. It appears to have been this experience that caused in him the determination to fit himself for a career of surgery and teaching.

A not uncommon practice in Kentucky of that day, especially among the legal profession, was that of going to New Orleans with a flat boat load of produce (whisky, hemp, flour and nails) and setting up as commission merchant in that city. Often rewards were large. Dudley, risking his savings in such an enterprise, was successful enough in a short time to purchase a ship load of flour. Sometime in 1810 he sailed and sold it at Lisbon and Gibraltar (probably at war time prices to the British then in possession of the coast). Hastening across Spain he went direct to Paris.

Fifteen years before "a whiff of grape shot" had put an end to the mad carnival of terror, had abrogated the Divine right of insurrection and had set Bonaparte on a triumphal military career that was to place him on the throne of the Bourbons. At this time Paris was the capital of Europe; the Emperor of the French and his Austrian wife were living at the Tuileries; France was at peace with Europe except in the Peninsula where Britian and the Spanish peasants kept up a persistent nagging conflict; the spirit of Paris was electrical; a new power was making itself felt in every line of endeavor; the glamour of victory and superiority was over all—no wonder Dudley was captivated and fell in with the spirit of his surroundings and that he acquired French habits and mannerisms that were to remain with him to the end.

Paris with its vast hospitals and abundant material presented much to interest the student of medicine in 1810.

Pinel was getting old but could be seen daily at the Salpêtrière where he had removed the chains from those miserably sick of mental disease.

Dupuytren, assistant surgeon at the Hôtel Dieu, was well started on a career of tremendous surgical activity that was to win for him world-wide fame as an operator and a fortune of a million and a half dollars, leaving his name to an instrument still in use and to a deformity of the hand.

Bichat had been dead eight years, yet in his brief but meteoric life of thirty-one years, he had blazed trails that were to become the well-traveled roads of histology and pathology and had done much to place the French teaching of anatomy in a position of preeminence that was retained for more than half a century.

Boyer and Dubois contributed their share and are mentioned by Dudley with admiration, especially Dubois.

At the Invalides in the intervals between campaigns could be seen and heard Larrey, the great and good Dominique Jean, Baron, Larrey, the greatest military surgeon of all time of whom Napoleon wrote in his will: "He was the most virtuous man I have ever known."

Of all men in France, aside from Napoleon, it was Larrey whom Dudley most admired and it was from him that he undoubtedly derived many ideas that were to serve him so well in his surgical practice. To mention but a few there were: (1) Gradually applied pressure for hernia of the brain. (2) Discarding of greasy ointments and pastes in the treatment of wounds. (3) The principles of muscular relaxation obtained by the application of the circular bandage. (4) Not waiting for a line of demarcation in progressive gangrene. (5) Meddlesome interference with the healing of wounds by too frequent dressings.

Dudley was in Paris at the time of Napoleon's ill-fated Russian invasion, was there on that fateful December night in 1812 when the Emperor returned and through the influence of Caulaincourt was present when the Emperor addressing the Deputies began by saying "The Grand Army of the Empire is annihilated." He used often to say that this was the most impressive experience of his life. It has been said that he was offered a staff position in Napoleon's army, but he preferred to return to America.

Leaving his apartment in the rue de Colombier after becoming thoroughly saturated with the teaching and traditions of Paris, Dudley went to London where he remained for about a year, living in Bow Lane. There were three men in London who influenced profoundly all his surgical life. They were Cline, Abernethy and Cooper.

Henry Cline, surgeon at St. Thomas' Hospital, was the only man in all London willing to help Jenner in proving the efficacy of vaccination. From Cline Dudley learned much about lithotomy. It was Cline's gorget he always used in entering the bladder and it was also from Cline that he got the idea of trephining for epilepsy, the beginning of brain surgery.

The mantle of the immortal Hunter had fallen upon the shoulders of a man who has been described as an irritable, cranky, wise and lovable genius, John Abernethy, surgeon at St. Bartholomew's. In personality and influence, Abernethy towered far above his more successful competitors. His lecture rooms were always crowded with eager students. He taught from nature, from experience, as well as from the book and he expounded John Hunter. It was Abernethy to whom Dudley looked as authority in all matters of surgical philosophy and this authority with him was final.

Astley Cooper, surgeon at Guy's Hospital, became Sir Astley after removing a wen from the head of George IV. He was regarded in his day as the most skillful surgeon in the world. His work on tumors of the breast is one of the milestones of breast surgery and his volume on hernia, from an anatomical standpoint, has never been excelled. Dudley studied Cooper, not only as an operator and teacher, but probably also, as that most desirable object, a success.

As has been often stated, Dudley did not have a brilliant mind, but knowing what he wanted, limiting himself to that alone, devoting his whole time and attention to that one object, he developed a peculiarly retentive memory of all experiences bearing on that subject and later an ability to describe simply and directly all such experiences.

And so in the summer of 1814 we find him once more in Lexington where he is to spend the rest of his life. But it was not the same Dudley who left it four years before. Fully conscious of his powers he came to win.

All who have written of Dudley say that he was not a student. While this is true in a literary sense, his capacity for learning by observation and experience more than compensated for this deficiency. He had a considerable knowledge of Anatomy and was well grounded in the principles of Surgery. He had vigorous health and strength. He had ambition and great industry. He had a sense of publicity, of showmanship without which only a genius of the first class may obtain full recognition in his generation. He also had a capacity for intrigue which he was to use without reserve to secure his ends.

Lunsford P. Yandell says of him:

> His profession had become the engrossing object of his thoughts, and from that time on until age made it necessary for him to relax his labors, he applied himself to it with undeviating fidelity. I am sure I have never known a physician who made himself more a slave to his profession. He had no holidays. He sought no recreation; no sports interested him.

To one so equipped, success, full and immediate, could not be denied. When he came to Lexington in 1814 he found in the west none to meet his challenge save Ephraim McDowell of Danville, whom he quickly distanced in the minds of his contemporaries. He soon acquired a proficiency in operating which rapidly developed into outstanding skill.

That he proved himself in the eyes of his associates and the people at large more than equal to the tasks that confronted him is evidenced by the fact that within a period of six years he was the acknowledged leader in his chosen field throughout the west.

Dr. C. W. Short, Hopkinsville, Kentucky, writing to his Uncle Wm. Short in Ballston-Spa, N. Y., under date of June 16, 1821 says:

> Dr. Dudley and my sister (Anna), who were married on the 10th inst., have arrived here. . . . They return immediately to Lexington where Dr. Dudley's business requires his constant attention. He ranks higher than any other man in the western country as a surgeon and has been singularly fortunate in some of the most important operations.

And again five years later (December 4, 1826).

> Dr. Dudley is surely a very excellent anatomist and a capital operator. He has performed, I imagine, more of the great operations in surgery than Dr. Physick—and has become more singularly fortunate in them. He has that pleasant agreeable manner which so strongly characterized Dr. Wistar with whom he may compare very creditably as a lecturer.

Within a year of his return Dudley, with James Overton and Rev. James Blythe, began teaching Anatomy and Surgery, Medicine and Chemistry, in a vacant room in Trotter's warehouse and continued these courses until 1817 when Transylvania took over the enterprise and enlarged the course to include Materia Medica and Obstetrics. Daniel Drake and Wm. H. Richardson were chosen to fill the respective chairs. Before the end of the session temperamental differences had developed acute antagonisms. Result, Dudley had shot and wounded Richardson. Overton, "disgusted with medical politics, had moved to Nashville." Drake had refused to fight with Dudley for what he regarded as sufficient reasons and issued from Cincinnati an appeal to the Justice of the Intelligent and Respectable People of Lexington, a scathing tirade in which Dudley is pictured variously as an ignoramus, a bully, a liar and what not, and concluded by saying, "The obligations of official duty might compel me to associate with such a man, but nature would defend me against his friendship."

Dr. Graham, friend, student and demonstrator for Dudley, in a letter to Dr. Peter says the dispute arose over an autopsy on an Irishman who had died as the result of a head injury. Following this dispute there was an exchange of pamphlets in which Dudley appeared at a disadvantage to Drake. However, says Graham, Dudley chose another method of obtaining satisfaction and challenged Drake to a duel. In the course of the dispute charges, involving the veracity, not only of Drake but also of Blythe and Richardson, were brought by Dudley. Drake refused to accept the challenge which was, however, accepted by Richardson. The duel resulted in Richardson being severely wounded, the femoral artery being severed. Dudley, with permission of his antagonist, who would have speedily bled to death, placed his thumb on the vessel at the groin and controlled the circulation until Richardson's surgeon could secure and tie the artery, an act of surgical instinct.

Graham describes the preparation for the duel. He and Dudley for several nights before hand would assume positions in diagonally opposite corners of the room over Dudley's shop and rehearse the details. Dudley said he wished to fight in a green suit he had bought in Paris. Graham, without Dudley's knowledge, cut all the buttons from the outside to reduce conspicuous sights to his adversary.

No attempt seems to have been made to conduct regular classes in 1818–1819, but in the latter year, under the presidency of Dr. Horace Holley, a fifth attempt to launch a medical school with a full faculty was successful. Charles Caldwell and Samuel Brown were added to take the places of Overton and Drake. Both the additions were cultured broad-minded men. Caldwell, a phenomenon of industry, was of wide information, a wordy controversialist, of handsome pleasing personality, a ready speaker with a ponderous elocutionary style, a superlative egotist, often comparing himself to Benjamin Franklin, boasting even that his autobiography was longer than Franklin's. But in spite of all his boasting, or perhaps because of it, he was widely and favorably known and he has the credit of being the first in America to teach Medicine at the bedside. He was perhaps the most useful acquisition the school possessed in its early days. In his autobiography he thus describes his associates: "I had under my direction one of the most miserable faculties of medicine, or rather the materials of which to form such faculty, that the Caucasian portion of the human family can well furnish or the human mind easily imagine." Of Dudley he says: "The fourth professor though perhaps the most meagerly endowed of the whole by nature, was the only one that was qualified and resolutely determined to work."

Samuel Brown, the other addition, was one of the first medical faculty of 1799; was a cultured experienced physician; a fluent talker and a man of high principles. He had in 1802 applied vaccination to a whole community "before Jenner could get the confidence of the people of his own country."

This group got along about as well as could be expected for eighteen years. In 1825 Brown quarreled with Dudley and left. Drake returned in 1823 and left again in 1827. C. W.

Short was added in 1825 and John Esten Cook took Drake's place in 1827. The number of students increased from 37 in 1819 to 262 in 1835 and in 1837.

Young Vesalius, who three hundred years before, on moonless nights fought with savage dogs beneath the gibbets of Montfaucon for the bones of criminals to complete his articulated skeleton, was hardly more zealous than the youths of the early Transylvania Medical School in securing their anatomical material.

Lexington was never a village. From its beginning as a frontier trading post it was a self-contained little city with a cocky individuality, but the little city of 1820–1850 contained few of the derelicts whose mortal remains, in larger cities, find their way to the slabs of the dissecting rooms.

One of the earliest students, Dr. Christopher Graham, whose observations are often more entertaining than accurate, has left us the record of several episodes of this resurrection period. So enthusiastic were the followers of this nocturnal pastime that graves for a long time were closely watched, so closely in fact that it was sometimes impossible to secure enough material to carry on the anatomical work. In fact it was this particular lack that was largely responsible for the decline of the school.

In September, 1823 Dr. Dudley addressed the trustees asking for sufficient money to purchase a team and wagon and to employ a reliable man to go to Louisville for bodies. He stated that Cincinnati had made it impossible for him to secure material in that city and that the year before he had broken down his own team in this work of transportation. (The sum requested was $1500.) In 1829 the faculty urged the trustees to seek the enactment of a law giving to the college the right to the bodies of criminals legally executed and of those dying in the penitentiary. (It was naively argued that this might have a deterrent effect on persons contemplating crime.) Dudley's work as professor of Anatomy was greatly hampered by this continuous dearth of cadavers. He was wont to say he would rather be damned than to meet his class, so unprepared was he.

Sometime in 1834 Dudley seriously proposed to the faculty that the medical school of Transylvania be moved to Louisville, a town then of some thirty thousand and rapidly growing. The faculty in unanimous agreement was pledged to secrecy until plans could be perfected. Certain of their number, however, were so enthusiastic that they talked openly and were active in their efforts at removal, incurring thereby the resentful hostility of the trustees and the good citizens of Lexington. Dudley was active in the movement until late in 1836 when he deserted the cause, leaving four of the six members of the faculty "on the spot." In March, 1837, the trustees declared all chairs vacant, dismissed Caldwell, who had been most active, and failed to reappoint Yandell and Cook. The following year Dr. C. W. Short voluntarily joined the group in Louisville. During the deliberations Dudley announced to the trustees that he would resign if Caldwell or Yandell were reappointed. At this time, in the minds of the trustees, Transylvania without Dudley was unthinkable. For the next thirteen years of his life Transylvania was Dudley and Dudley was Transylvania and he saw to it that at all times there was some outstanding medical man in the faculty, in some instances himself personally guaranteeing to the trustees the salary of such incumbent. John Eberle, N. R. Smith and Elisha Bartlett were the most distinguished of this group.

One of his obsessions was that the chairs of Anatomy and Surgery should be held by one professor on account of the close association of the subjects. It was this notion, persisted in for twenty-five years, that was responsible for much of the dissension that continually rocked the faculty, being the chief or secondary cause of the resignations of several of its valuable members. Dudley wanted no one around who would or could in any way offer any show of competition. He refused even to consider the appointment to the chair of Anatomy of Dr. George McClellan, one of the ablest anatomists of his day, but finally consented to allow Dr. Bush, his friend and assistant, to take the chair although his work as demonstrator had been far from satisfactory. This when Dudley was fifty-nine years old (1844).

In 1850 he resigned his professorship though he continued for several years to operate and to visit patients from his home at Fairlawn on the outskirts of the town to which he had moved in 1846.

Anna Short Dudley died in 1827 and Dr. Dudley never remarried. In 1866 he moved to the house of his son W. Ambrose Dudley in the city where he died on the 20th of January, 1870. He is buried beside his wife in the Lexington cemetery.

Transylvania Medical School, deprived of its chief, was unable to compete in the unequal struggle against the more fortunately situated schools of Louisville and Cincinnati and breathed its last in the year 1857.

In the thirty-five years of its existence as a medical school Transylvania's roster of teachers includes such leaders of medical thought and practice as Brown, Caldwell, Drake, Cook, Yandell, Eberle, N. R. Smith and Bartlett, a truly remarkable group. Three of them Osler places among the first five of their day. To them, students from all the South and West came to prepare themselves in Medicine, but there was one who in the minds of the students outshone all the rest and that was Dudley. Less endowed by nature than many of those mentioned, less educated, without brilliancy or wit, he held the attention of his students completely from the beginning to the end of the session. The students might fail to be impressed by the good sense of Drake, might yawn at the stilted rhetoric of Caldwell, or slumber during the reading of lectures by Short, but their interest never flagged during Dudley's lectures. His knowledge of his subject was comprehensive. His language was simple and direct without effort at adornment; his voice clear and sonorous. His experience, vast and varied, was so catalogued in his mind that it was instantly available to illustrate his theme. His teaching was positive and without reservation or doubt, his manner dignified and impressive. Aiding in this was his subject, Surgery, with the appeal to the young man of a doer and of expert craftmanship, and finally and not to be omitted was "the bloody drama of the operation," in which he was the chief actor, the perfect artist.

Dr. Bedford Brown (1892) describing Dr. Dudley says: "In his black broadcloth suit, swallow tail coat, unvarying white necktie, silk hat, clean shaven face, dignified demeanor, gray hair, Dr. Dudley might have been mistaken for a well ordered respectable clergyman." His personal appearance was the beau ideal of neatness and cleanliness and the pleasant smile that so often adorned his face might lead one to mistake his temper which was quick and irascible. In movement and gait he was quick and decided. He was frugal and abstemious in all things. Morally and physically he was without fear.

Few men, says Brown, possessed more acute and clearer powers of observation, more penetrating foresight, more accurate views of the practical side of all surgical questions, or had profited more richly by personal experience than Dudley. "As an operator, for cool, deliberate, calm self-possession, unfaltering courage under difficulties, precision and dexterity in handling the knife, Dr. Dudley was unsurpassed in his day."

Amidst the heart-rending screams of his patients, he was never thrown off his balance, but would remark: "Let them scream—it is a relief of nature." But when, unable to stand further the pain of the operation, the patient would struggle, a command was uttered in a voice not to be misunderstood: "Be still, Sir, or I'll send your soul to Hell in half a second." The order would be obeyed.

Dudley perhaps would have left us nothing in writing had it not been for the urging of his associates. At any rate, we find the first article of the first number of the *Transylvania Journal of Medicine*, 1828, is entitled "Observations on Injuries of the Head" by Benjamin Winslow Dudley, professor of anatomy and surgery in Transylvania University, member of the Royal College of Surgeons, London.* Here the author describes five cases of traumatic epilepsy operated on by the trephine with entire relief in three and improvement in the other two. These cases are among the first, if not the first, in this country so treated. On account of the frequency of remote evils he councils more frequent operation in depressed fractures of the skull. He says also that collections of encapsulated fluid are probably more frequent than was thought and he further states: "It rather appears to constitute a matter of astonishment that arguments in favor of removing pressure from its [the brain's] surface should be thought necessary."

This paper, as do the rest of his writings, reveals an independence of thought and action characteristic of the man. Other matters touched on by him concern the subjects of the bandage, calculous disease (stone in the bladder), hydrocele, aneurysms, and cholera. All of them have the assumptions of his day regarding causation but are emphatic and clear when it comes to treatment.

Everyone has a hobby of some sort; Dudley's hobby was the roller bandage and in his hands it became an agency of importance equal to, or greater, than the knife. His skill in its application was the result of assiduous practice and thoughtful consideration of the nature of the affection and the part affected. The smoothness of its application and the degree of pressure were regulated to a nicety. It was not a procedure to be delegated to an assistant but a delicate operation for the master hand of the surgeon himself. He used it in the treatment of all fractures of the extremities except those of the forearm and by securing muscular relaxation, adjustment of the broken bones was obtained and maintained by posture alone.

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* Dr. Dudley was admitted a member of the Royal College of Surgeons on January 7, 1814 by examination.

That his results in this field were excellent is evidenced by a letter from his nephew, E. L. Dudley, who in 1849, writing from Paris, makes comparison very unfavorable to European practice with splints and clumsy apparatus and the then new starched roller (the forerunner of the plaster bandage).

The roller bandage he also employed in many other conditions: gunshot wounds, acute and chronic inflammations, ulcers, milk-leg, lacerations and contusions of all kinds and extent, and aneurysms. In the treatment of the latter affection in peripheral arteries he was able to maintain the circulation in the extremities and reduce the flow of blood into the sac by graduated pressure of the bandage until cure was effected in all cases but those with impending ulceration. In his treatment of bone felons it makes one shudder when he writes of compressing the swollen finger in his hands for from two to five minutes to reduce its size before applying the bandage, and yet he says one must be careful, after the bone comes away, not to compress too tightly lest the finger or thumb become too long. He was once threatened with suit because of such result.

After amputations the bandage was the only dressing and union by first intention was the rule. Often no vessels were tied, compression alone by the bandage being relied on. The second dressing was a week later. The bandage was of plain calico or muslin and when rolled was moistened with spirits and again just before using. No cerates or ointments were ever employed. Perhaps some day in the future some unknown surgeon will discover a new method of treating many surgical affections, which will be far superior to those of the present, and that method may well be the roller bandage.

He was the first in this country to ligate the carotid for pulsating exophthalmus and his ligation of the subclavian was the first of its kind in the West. His operations on the eye included those for cataract. He seems to have done both needling (discission) and extraction of the lens and these, as all other critical operations, were preceded by a period of conditioning to be described later.

He seems to have performed ovariotomy but once and that with fatal result.

He was a strong opponent of indiscriminate bleeding but employed it in what he considered suitable cases.

It is as a lithotomist that Dudley was most widely known. His first operation for stone was performed in 1817 and in the course of his practice patients came from all over the land to get the benefit of his skill. His reputation in this line transcended national borders. He always performed the lateral operation and always used the gorget of Cline. The details of his operations have been clearly and accurately described in the sketch of Dudley by Bedford Brown (1892), one of his pupils (1846).

Dr. Dudley did not dislike writing, he hated it. His desk was disordered, with letters and papers in confusion. His work was finished when his patient died or was cured. Only a few accurate notes were made and these in cases of unusual interest. He relied on his memory; so much the worse, for it has furnished his critics with ammunition to shoot at his claims and has raised a question of doubt as to accuracy in the minds of the dispassionate searcher for facts.

Dr. Graham said he never lost a case of lithotomy. Dr. Brown says the number was three; Gross says the claim was six or seven but he did not believe it; Dr. Bush said the number was four.

Dr. Peter, who was closely associated with Dudley for the last twenty years of his professional life and of whose accuracy there should be no doubt, makes the statement that "he performed the operation of lithotomy 225 times losing only about 2 per cent," nor do I find after much study any reason to doubt these figures.

When one considers the state of surgery in general in his day his results are nothing less than amazing. Consider, however, the following facts: he was a firm believer in the teachings of Abernethy; that nearly all local diseases were of systemic origin or were aggravated by systemic derangement.

Dudley says: "*The preparation necessary for and the treatment consequent to all critical operations is even more important than the greatest skill in the use of instruments.*" In his preoperative treatment, which lasted from a few days to three months, the diet was strictly regulated and the stomach, liver, bowels and kidneys were treated by appropriate doses of calomel, ipecac (or tartar emetic) and copious draughts of water. During this period the action of the heart and lungs was watched. The condition of the tongue, and breath, the skin, the eyes, the urine and excreta was carefully noted, as was also the state of mind and the appetite and general state of vigor, and this system of observation and regimentation was continued until as nearly a normal condition as possible was reached.

Bedford Brown further tells us that his "neatness and cleanliness did not end at the personal limits—they were principles in the practice of his profession that he held sacred and never to be departed from." Always before operating, his patient had a thorough bath.

In some way Dudley got the idea that water contained impurities injurious to wounds and that boiling the water rid it of these impurities. It was his practice to use only boiled water and that copiously on wounds of all kinds, clean and infected. Pads soaked in boiled water were used as compresses on wounds enclosed in his roller bandage. His instruments before using were also washed and rinsed with boiled water.

Here we find an able surgeon who by some accident or instinct had grasped the essentials of modern surgical practice half a century before the principles underlying them had been revealed. His results, therefore, from a modern standpoint are entirely credible. So satisfied was he with his results that he never changed his methods, nor is there evidence that he ever used anesthesia. During the dreadful cholera epidemic of 1833 in which he did yoeman service his cleanliness and his use of cistern water, which he considered next in purity to boiled water, preserved his entire family from the disease. Knowing nothing of bacteria, Dudley attributed his success to the fact that in the Ohio Valley, people, places, and things had not been contaminated by the effluvia of human concentration which so vitiated the air of the European hospitals. To the writer it would seem that there was something present in the Ohio Valley and absent from the European hospitals that was responsible for these results and that something was Dudley himself.

Although generous to his poorer patients Dudley accumulated a considerable fortune. His largest fee for lithotomy is said to have been five thousand dollars. Once upon a time Dr. Dudley operated for stone upon a boy whose father was unable to pay at the time. He was told he might pay for it when he could afford it. Some sixty-five years afterwards the patient died in the West and stipulated in his will that the heirs of Dr. Dudley be paid the usual price for such an operation with 6 per cent interest. The late Mrs. Charles W. Short received the bequest and donated the same to the Good Samaritan Hospital to equip a room in his memory. He always loved Lexington and after 1814 left it only twice, once a trip for his health in 1829 and once a visit to Europe in 1831. He refused to consider a call to the surgical professorship in Jefferson Medical School of Philadelphia.

In politics Dudley was an ardent supporter of the Whig cause and of his friend, Henry Clay, and in times of need on election day he would assemble his cohorts, bring them to the polls and see that they voted "right."

In matters of religion he was not much concerned (he had no imagination) yet as a testimonial to his strength it must be said that throughout the hectic period of sectarian controversy in which he lived, his position of leadership was never challenged on account of this indifference.

Among his admiring friends was that tragic character immortalized by James Lane Allen, King Solomon of Kentucky, the drunken hero of the cholera of '33, who always addressed Henry Clay as Henry, who sold himself alive to a negro woman and his body after death to Dudley for dissection. On his deathbed he sent for Dudley and asked him to forgive the debt. This was done.

To such a character human relations are always positive; on the one hand unswerving loyalty or abject submission; on the other vitriolic hatred—never indifference.

Some of the pamphleteering dogfights of his day contain real gems of invective. Dr. James C. Cross, who had undoubtedly conducted his chair in an able manner but who was a person of poorly assembled moral fiber, was unceremoniously kicked out of the faculty in 1844, a few days after suggesting that Dr. Dudley give up one of his professorships. His reply to the "Statement of Facts," etc. concerning his dismissal is presented in an altogether convincing fashion. This reply is directed at Dr. Dudley but his reference to Dr. Peter is worthy of preservation as a model.

> Were I, however, in a fit of indiscretion, no matter from what cause, to gratify the vanity of this little compound of repugnance, prejudice and disgust, by magnifying him into an object of sufficient importance for serious or special notice, the notoriety he would gain would be nothing more than a temporary phosphorescence like that which surrounds a decomposing carcass in the dark, that is dispelled by the first beams of the rising sun and exposes to view the disgusting source of the mephitic radiance.

Of his pupils, many of whom achieved more than local prominence, only two will be here mentioned. One Joshua Taylor Bradford of Augusta, Kentucky, became the most successful ovariotomist of his day; his mortality was 10 per cent (1840–1870). The other was Crawford W. Long, the discoverer of ether anesthesia; and surely anyone who had to do with the medical education of Long might well say, as did Simeon of old, "Lord, let now thy servant depart in peace."

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THE MEDICAL SCHOOL AT PADUA AND THE RENAISSANCE OF MEDICINE*

By ARTURO CASTIGLIONI, M.D.

PADUA, ITALY

AMONG the first universities which arose in Italy at the beginning of the thirteenth century, and slowly organized on the lines of the ancient Latin schools of the Empire, taking certainly as model in Medicine the Salernitan school, which was the first lay medical school of which we know the organization, Padua is perhaps the one which most surely and rapidly affirms a spirit of independence which sometimes assumes the character of a revolutionary tendency. The intellectual tendency of the University has a well-defined characteristic note: the little university was formed at its beginning by a group of students when the Princes of Carrara dominated the town. In the year 1222 a few students of Bologna abandoned the school of law of this town which seems to have been already well organized and migrated to Padua, bringing with them some of their teachers, as had happened some years before when a group of students had chosen the town of Vicenza as their seat of learning. At that time and still more in the following century the University was much more bound to the scholars and to the teachers than to the city: Universitas meant exactly a community of students who chose their masters and then formed an independent organization. These men who considered study as the principal aim of their lives let themselves be easily induced to change their residence, going where the conditions of life were more favorable, the protection of the Commune and of the Princes more efficacious, the safety of life greater and the kindness of the citizen more cordial. In many cases the students were attracted and enticed from the one or the other town with promises of particular privileges, of exemption from the taxes, of excellent teachers. Thus in 1228 Vercelli, which was a little town in Piedmont, sent to Padua its representatives to invite the students with the largest promises to come there. From the document witnessing this fact which is still preserved one can see that in the year 1228 four groups of students already existed, divided according to their nationality: the first of Latins of the langue d'oil (that is to say French and Normans), the other of Latins of langue d'oc (Provencals, Spaniards and Catalans), one of Germans and one of Italians. In this time the students must have been a great number, because the town of Vercelli promised to find for them 500 lodgings and more if it should be necessary.

During the whole thirteenth century the prosperity of the University of Padua increased in spite of the menaces of the Emperors and of the Popes who were often in conflict with the town: the corporations of students were sometimes only two: Transalpini or Ultramontani and Cisalpini or Citramontani.

This division according to Nationality was for some centuries the only recognized and perfectly ordered: not until the beginning of the fourteenth century was the universitas artistarum, medicinae, physicae et naturae constituted as a faculty which collected all students of natural sciences and of medicine, with rights equal to those of the universitas juristarum, the faculty of law. But the medical teaching had been organized from 1250 at which time two chairs of medicine were established. In 1262 the chairs of medicine were three and the tendency to entrust different professors with the teaching was more and more manifest. In early times the teachers were elected by the students, but this gave origin to such tumults that the elections began to be made by the State, and at the end of the fourteenth century professors were appointed only in this way. During the thirteenth century when the Arabistic current became stronger in Italy, and in literature, in art, and in science was felt the effect of the penetration into Italy of the ideas which had arisen in the great centers of culture of Islam, and the western world received from them through the Arabian commentators and the Jewish translators, unknown writings of Aristotle, Tolomeus and Galen, and when the dawn of the Renaissance of classical studies, which had later a stronger impulse, began, when with the fall of Constantinople some eminent Greek scholars came to Venice and spread the study of the Greek language, Padua had already the name of an Averroistic university, almost in opposition to Bologna which was essentially scholastic.

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* The Nathan Lewis Hatfield Lecture, XII. Read before the College of Physicians of Philadelphia, November 29, 1933.

In Padua at the beginning of the thirteenth century taught Pietro d'Abano (1250–1316), a physician and philosopher who was one of the most eminent scholars of this time and who with his vast literary and scientific lore dominated the whole learning of this epoch. He attempted to resolve with syllogisms the contradictions which arose between the medicine of the Arabic authors and speculative philosophy; he endeavoured to prepare a complete treatise of theoretical and practical medicine in which all tendencies should be reconciled and the scholars could be informed both concerning that natural philosophy which in the opinion of the author was the pivot of all sciences, and concerning diseases and their remedies. An Averroist in his ideas, a dialectician in form, in his book "Conciliator controversiarum quae inter philosophos et medicos versantur," from which he had the name and the fame of a conciliator, he stated all problems as dialectical queries and solved them so that in almost every case the empirical proofs were overcome by the syllogism. And yet through the farrago of these philosophical discussions the acute observation of a man of genius is apparent. His true master in medicine was Avicenna: in his studies on the soul Pietro was generally faithful to the ideas of Averroes, but sometimes he contended against Aristotle and Averroes at the same time; doubtless he showed himself a man who was able to detach himself from the classics and to discuss the authority of the greatest of them.

Pietro d'Abano was one of the first and strongest defenders of the Italic Averroism in which one must recognize the rebellion against the yoke of theologizing philosophy. Averroism collects some ideas and tendencies deriving from the great Arabian physicians and particularly and above all the thesis of the common intellective soul of the human species. One should not forget that Averroism means first Arabism, and then all those who had drunk at the Arabic sources and accepted the authority of the great Commentator of Aristotle.

Fig. 1. Portrait in Bronze of Fracastoro. By C. Danese. In the Museum in Vienna.

The influence exercised by Pietro through his teaching and his books, some of which were considered till the end of the fourteenth century as very authoritative texts, was certainly deep and vast, and even Dante who lived at Padua at this time and probably was one of his pupils, felt his influence. The name of this physician and philosopher, who had gone to Constantinople in order to study Greek and to read Galen and Aristotle in the original texts, and the fame of this scholar, who had taught medicine in Paris and had been considered there as one of the greatest masters, were diffused through the whole of Italy. His fame moreover was perhaps increased by the news of the persecutions by the Dominican friars who had accused him of heresy because of forty-five propositions contained in his work which were considered contrary to Christian dogma. When he was called to the city of Padua, and became in the year 1306 professor of medicine at the University, his name was already well known to all who dedicated their studies to philosophical researches. An eminent physician, he very soon became a celebrated practitioner and was consulted by Pope Honorius IV and the Marquis Azzo d'Este. The crowd of students who came to attend his lectures was so numerous that Gentile da Foligno, one of the great surgeons of this time, when he came before the hall where the master was teaching fell on his knees crying out: "Hail, holy temple!"

During the thirteenth century the study of medicine flourished in all the universities of Italy and while in Bologna with the teaching of Mondino de'Luzzi the new travail of anatomic thought was beginning, and the first surgeons, heirs of the Salernitan teaching, were taking their first steps towards the institution of the new surgery, Padua became at the end of the century the most important center of epidemiologic studies. The pestilence, which about the middle of the twelfth century had devastated Italy, taught the necessity of defensive measures, particularly for the sea towns which drew their wealth from the over-sea trade; and as early as the year 1374 Venice forbade entrance into the town of infected or simply suspected persons and goods. Ragusa published at first by-laws concerning quarantine; and very soon, at about the end of the century, Venice collected all the measures against pestilence in an exemplary sanitary legislation. To this end the contribution of the great masters of the Paduan university was very precious. Among these teachers Pietro da Tossignano, author of the renowned advice against pestilence, was one of the most famous; but the most authoritative was doubtless Gentile da Foligno, who had been called in 1337 by Count Ubertino di Carrara to teach medicine at the university. He was called "the soul of Avicenna" and his advice had the greatest diffusion. Genoa, and the towns of Tuscany and of middle Italy took counsel with him in difficult cases.

In the thirteenth century there is an important development in the study of anatomy: Pope Sixtus IV gave official permission to dissect, and Alessandro Benedetti, a teacher of anatomy in Padua about the end of the century, published a treatise on anatomy in five books and 138 chapters, affirming the necessity of anatomical dissection independent of the custom, generally accepted till that time, of conceding to the school only the corpses of executed persons. To him we owe the construction of the anatomical theater where he delivered his first lectures; to Antonio Benivieni, the merit of having been the first forerunner of Morgagni, with his important observations in the field of pathological anatomy, to which he brought an important contribution of exact observations.

At the end of the thirteenth century flourished in Padua the study of botany, which became the foundation of all later researches in the field of natural sciences. Among the humanistic authors who held Pliny in great honor, two deserve to be particularly noted: Giorgio Valla, a Latinist of great worth, a deep scholar in classical literature, who conferred elegance upon scientific language, and Ermolao Barbaro, an eminent philosopher, who endeavored to restore the text of Pliny and wrote a commentary on Dioscorides.

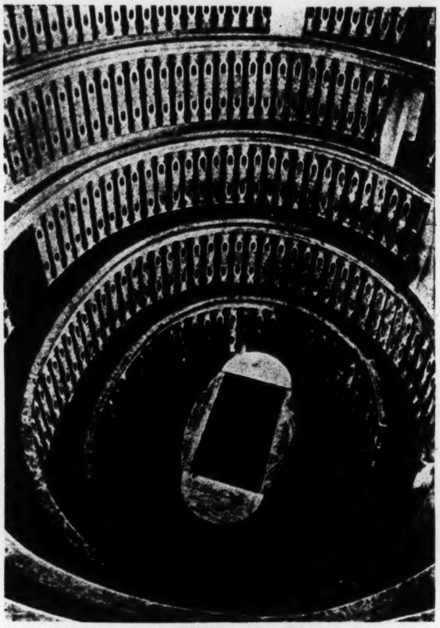
FIG. 2. ANATOMICAL THEATER IN PADUA, BUILT FOR FABRIZIO D'ACQUAPENDENTE.

The life of this man, who can be considered as the prince of the humanists of this time, deserves really to be quoted: he was crowned poet laureate in his fourteenth year by Frederic III, took his degree in Padua in 1477; translated and published some books of Aristotle, held public office, taught the Greek language and literature, and had in his home gatherings of the most celebrated scientists of his time. He was in 1486 ambassador of the Republic of Venice to the Emperor Frederick, and in 1489 ambassador to

Pope Innocent VIII, who created him Patriarch of Aquileia and Cardinal. He died in 1493, not yet forty years old, leaving some works which reveal an astonishing erudition and a perfect knowledge of the Greek language and literature and of classic antiquity.

Thus we find about the end of the thirteenth century the first bud of the renaissance of medicine, which flourished contemporaneously with the renaissance of philosophy, of letters and of art, in the most brilliant period of Italian history, when the university, especially through secular work of patient researches opened its doors to the new doctrines which tended to deliver science from its bonds.

The return to the old texts, begun by the Italians who had never lost contact with the Greek spirit, ardently supported by the humanists, rendered the relations of the western world with the Hellenism more intimate. While on one hand the return of the old Greek and Latin authors in their original form seemed at the beginning to strengthen their authority and to make criticism of them more difficult, on the other hand the Italians discovered in the old texts those sane reasonings, keen observation, and freedom of inquiry and criticism, which for too long a time seemed to have been forgotten. One begins to understand in Italy that more than the maxims of the ancients, the spirit which dictated them is admirable: the Italian spirit comes little by little nearer to the thought of the ancient classics and to the form of their literature; and I believe that it is essentially from this humanism that free and fruitful criticism, objective and impartial is born, which grows with individuality in medicine and in art, with the desire to see new things and to think with one's own brain instead of accepting supinely the dogmatic affirmations of the school. In the spirit of humanism the foremost factor of the renaissance of medicine has to be sought; a renaissance which was in preparation during the last centuries of the Middle Ages with the studies of anatomy, with the first clinical observations, with that love of nature which is characteristic of the Renaissance.

At the end of the century another factor of great importance contributes to prepare the new times, that is the invention of printing. To this epoch belong the first printed and partly illustrated texts of medicine, and in order to imagine what a change the diffusion of printing brought also in the field of medical culture it suffices to remember that as late as in 1395 the University of Paris possessed only some few manuscript books of medicine.

The part which Venice and the Venetian printers had in the diffusion of medical culture is noteworthy. We must recall that in the last decade of the fifteenth century two hundred Venetian printers published 1500 works, more than all the other printers in the whole of Italy. We must recall that to this epoch belong the first anatomical figures, and that it is probable that the sight of the first drawings, in some old reproductions of the five or six figures which represented the osseous, arterial and venous systems and were derived from Arabian and Persian manuscripts, had demonstrated their inexactness and made it necessary to replace them little by little with figures based on the examination of the corpse. Certainly the first old anatomic figures of the old handwritten texts, so plain in the ingenuousness of their lines, showed more evidently their errors and demonstrated that correction was necessary: perhaps it was thanks to the old drawings that the initiative for anatomical teaching through the figure arose, to which another fact gave an extraordinary impulse: the renaissance of the Hellenistic conception according to which disease is only a disturbed harmony which it behooves Nature to cure.

In this time of the renaissance of the conception of life, Padua was the only school in which freedom of research and of teaching was granted. In Padua Andreas Vesalius, who had been educated at Louvain and studied medicine at Montpellier and Paris and taught anatomy in Louvain, became in 1537 professor of anatomy. In Padua where the university, owing to the intelligent care of the magistrates of the Republic, was at this time in its greatest splendor, and where from every part of Europe scholars came as to the most renowned center of learning, Vesalius found that possibility of free research, that comprehension of his work and of his courageous criticism which rendered it possible for him to accomplish a work which seemed in his time to be incredibly audacious. The chief task of his life was to renew the teaching of the anatomy of the human body and to overthrow the teaching of Galen, which during sixteen centuries had not only prevailed but been considered indisputable. He demonstrated that the studies of Galen were based only upon animal dissections, and that all that concerned the human body had been hardly observed. He taught from the same chair from which all teachers had bowed to the high authority of the great master of Pergamon, that he had made hundreds of errors, and that it was necessary to begin again the study of anatomy.

FIG. 3. UNIVERSITY OF PADUA; MAIN ENTRANCE WITH THE LION OF SAN MARCO ON THE DOOR.

It was certainly excessive daring for a young man of hardly twenty-five years, and the struggle was very sharp; but Vesalius knew how to carry it, perfectly sure of the truth of his ideas, animated only by the conviction of the absolute necessity of clearing the field from all ancient superstitions. He was also in first place the great and courageous reformer of pictorial anatomic representation: in Padua some great artists, such as Mantegna, one of the first realistic painters of corpses, and Riccio, the exquisite sculptor who reproduced in his fine bronzes with perfect fidelity the forms and the muscles of men and animals, had certainly exercised their influence on the development of anatomical thought. Riccio was a great friend of the anatomist Marcantonio Della Torre and sculptured for this family of physicians in the Church of S. Fermo in Verona a magnificent monument, the bas-reliefs of which, at present preserved in the Louvre, belong to the best works of Italian Renaissance. Vesalius understood clearly the importance of adorning his book with the best drawings: he supervised with the greatest care those who worked for his book and to whom he probably indicated himself, the object of the drawings. He complains in his letters of the trouble they had caused him, and found as collaborator one of the best pupils of Titian, Jan Stephan Kalkar, a Flemish painter whose paintings were often difficult to distinguish from those of his master. Probably Kalkar engraved the pictures on wood: certainly the figures are executed with perfect truthfulness and with great taste, chiefly from dissections of youthful bodies. The drawings are free and bold and in the book of Vesalius we find for the first time in a text for students a clear representation of true facts in the most beautiful form.

Thus under the protection of an intelligent and strong government which considered the university as one of the most important instruments of its political power, in this fertile ground, modern anatomy, as Leonardo had imagined it in his solitary work, was born. In a time in which in the German universities anatomical teaching was not yet regular and when in Flanders Vesalius himself was compelled to undertake some adventurous expeditions with his students to steal the corpses of executed persons and thus make dissections possible, and when the great anatomist was persecuted at the Court of Spain by the enemies of his affirmations, Padua was the center of experimental science. When Vesalius set out on a pilgrimage to Jerusalem and received a call from the Venetian Senate to reoccupy the chair of anatomy, his greatest longing was to come back to the town which to him seemed "the only nurse of high genius."

But not alone because Vesalius was one of her great teachers and because in Padua his immortal book was written and the anatomical figures designed, does Padua deserve the first place in the history of the scientific renaissance in Italy. Before and after Vesalius Padua had among its professors some of the most excellent anatomists of all times. Here taught Gabrielle Falloppio who was certainly the most courageous of the innovators and the most illustrious of the Italian anatomists of this century. He departed even more decisively than Vesalius from the teaching of Galen. He corrected the descriptions by Vesalius of the anatomy of the cerebral arteries and of the clitoris: he described the tubes that bear his name, the oculomotor muscles, the cerebral nerves, the chorda tympani, the semicircular canals and the aqueduct. The first edition of "Observationes anatomicae" was published in Venice in 1651.

His pupil was Girolamo Fabrizio d'Acquapendente (1537–1619) who studied particularly the anatomy and physiology of the uterus and of the fetus. To him was due the creation of a new anatomical theater at Padua, which is still preserved. He was the author of an important study on the physiology of respiration and of the voice, and it is curious that he once treated this subject so profoundly that it is told that one day, in 1588, all the students of German nationality deserted his school, thinking that in the explanation of the mechanism of the muscles of the tongue he mocked their pronunciation of Italian. He studied not less deeply the physiology of the circulation and was the discoverer of the valves of the veins. He was the teacher of Harvey and in the hall of the old Paduan university, where the coat-of-arms of the most illustrious students are painted, we find that of Guglielmo Harvey, belonging to the Natio Anglica: a burning candle between two snakes of Aesculapius. That was the time in which from the whole of Europe strangers came to Padua to learn anatomy: a pupil of Falloppio was Volcher Voiter, born at Gröningen in 1534, died in 1600, whose works are important for the development of the anatomy of the human fetus and the child. A pupil of the Paduan school of anatomy was the Spaniard Juan Valverde di Hamuzco, who published a manual of anatomy in Spanish which had a great circulation. Of this anatomical school Haller could justly write: for a century and a half it was the leader of all Europe, so that there were but few dissectors who did not come from its halls.

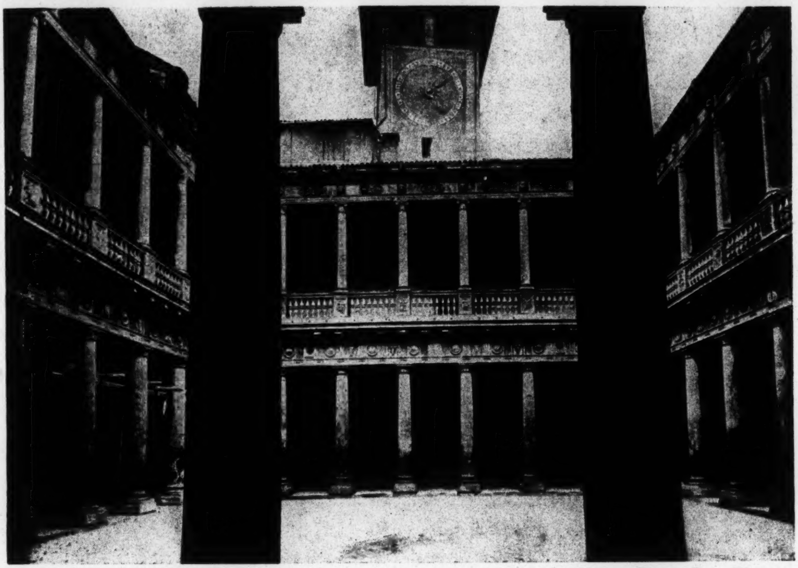

FIG. 4. HALL OF THE UNIVERSITY. THE CAMPANILE WITH THE CLOCKS WHICH RANG OUT WHEN A NEW DOCTOR WAS GRADUATED. IN THE RIGHT CORNER IN THE FIRST FLOOR IS THE THEATER OF FABRIZIO, NEXT TO THE SECOND COLUMN ON THE RIGHT THE COAT OF ARMS OF HARVEY.

The studies of physiology began in Italy with the Renaissance and many of them were devoted to the circulation of the blood, among which were those of Realdo Colombo, successor to Vesalius in the chair of anatomy at Padua, who in 1558 published a work in which he affirmed the non-existence of the passages through the septum of the heart between the right and left ventricle, belief in which up to that time had been generally accepted. He clearly stated that the arteria venosa (pulmonary vein) carried blood and not air and he indicated the greater circulation in a general way. He was the teacher of the greatest physiologist of this period, Andrea Cesalpino, a physician and a philosopher, born in Arezzo in 1519, who attacked one of the most important of the errors of the Galenic concept, namely, the inclusion of the liver in the greater circulation. He was the first to use the word "circulation" (1559) and observed what happened in the veins after a ligature had been placed about the arm. His discovery is the essential basis for the doctrine of the circulation of the blood which was later completed and clearly described by Harvey.

Thus the most important and decisive of the problems of physiology, whose solution marked the fall of the Galenic conception, found at the University of Padua its foremost workers: from Colombo to Cesalpino, from Fabrizio d'Acquapendente to Harvey. In a magnificent collaboration which had been hitherto without example the work of anatomy and physiology of scientists of different nations had prepared in Padua the triumph of exact sciences.

But clinical sciences very rapidly followed this movement. To this century belong the first studies of psychiatry of Giovanni Battista Da Monte who devoted his attention to melancholy and other forms of nervous diseases while Girolamo Mercuriale, a great teacher also in the field of hygiene and of medical gymnastics, endeavored to classify them according to the etiology; in Padua began the teaching of pharmacology which drew great advantage from the institution of the so-called garden of simples, of which the oldest was founded in Padua by Francesco Buonafede in 1545. Clinical teaching was initiated at the end of this century by Giovanni Battista Da Monte at the bedside of the patient. From this teaching in Padua the clinical teaching of the University of Leyden arose. Evald Schrevelius and Jan van Heurne, who had been scholars at Padua, brought this method of teaching to Holland where medicine throve in a free and very rich country which seemed to inherit in the seventeenth century the fortunes of the Venetian Republic and its part in the progress of science, just as it snatched from Venice, after the discovery of the new trade routes, the domination of the seas.

The most interesting figure of the Paduan Renaissance is surely that of Girolamo Fracastoro, a man of genius who was in Padua a comrade of Nicolaus Copernicus, a pupil of the great anatomist Achillini and a friend of Cardinal Pietro Bembo, the great humanist. Pathological conceptions had a very important evolution during the Renaissance, due to the fact that in this epoch certain diseases spread through Italy which up to then had been but little known: smallpox, chickenpox, influenza and typhus. In the sixteenth century syphilis spread all through Italy in the form of an epidemic disease which claimed many victims.

This is not the place to take up the much discussed historical question as to the origin of syphilis; that is, whether it was brought to Europe through Spain after the discovery of America or had already existed in Europe in milder forms. It is certain that it was spread through Italy more extensively than through other European countries and was closely studied and efficiently treated. Hieronymus Fracastoro was the most illustrious among the many physicians who dedicated their study to the pathology of syphilis. He wrote a poem, which was considered during the Renaissance as the most beautiful poetical work in Latin verse, worthy to be compared with the poems of the Golden Age of Latin literature. This poem, entitled "Syphilis sive Morbus Galicus," which was published in Verona in 1530, had an enormous and widespread publicity. The name of the disease is taken from this poem, in which Fracastoro told the story of a shepherd, called Syphilus, who contracted the terrible disease as a punishment from Apollo. He gives an exact description of the disease, prescribing the use of mercury and guaiac in its treatment.

The most important work of Fracastoro, although it is not to this book that he owes his greatest reputation, was the "De contagione et contagiosis morbis," published in 1546 at Venice, which is by far the most valuable example of his scientific value. Fracastoro was the father of modern epidemiology and was the first to study epidemic diseases in the light of scientific concepts, distinguishing three forms of infection and contagion. These were contagion by direct contact, such as scabies, leprosy, etc.; contagion by indirect contact by means of fomites, such as clothing, sheets, etc., which are carriers of the germs of the contagion and thus spread the diseases; and finally a third form in which the disease could be transmitted at a distance without direct contact, such as plague, smallpox and similar diseases. In such cases he imagined that the germs were propagated by selecting the humors for which they have the greatest affinity, entering the organism by means of the respiration. The germs (seminaria) were then thought to be absorbed from the breath and adhered to those humors which carried them to the heart. These germs according to Fracastoro have the power of multiplying rapidly. Those that infected animals could not infect plants, and vice versa, and there were even certain diseases confined to man or to certain animals; certain diseases had even special affinities for certain individuals or organs. Hence it is apparent from these statements that Fracastoro had a clear insight into the specific characteristics of contagion and should be considered as one of the important precursors of the modern doctrine of infection.

Among the diseases which appeared for the first time in Italy or rather were first studied in this century was typhus fever. In a Parmese diary of 1477 there is described an epidemic with high fever and exanthems, which was probably typhoid fever; also the so-called Merranic plague which spread through Italy from 1492 to 1493, as can be learned from the writings of the Jews banished from Spain. The first clinical description of this disease we owe to Fracastoro who in his classic book on contagious diseases described it with accuracy, distinguishing it from bubonic plague and typhoid fever.

The pathology of tuberculosis was also studied by Fracastoro, who maintained the contagiousness of the disease and the possibility that it might also be spread by means of the clothing and bed linen. This concept guided Fracastoro in prescribing prophylactic measures in the fight against tuberculosis: he forbade the use of purges or of substances which hindered expectoration. In all his work it can be clearly seen how modern scientific epidemiology had its origin in the outstanding writings of Hieronymus Fracastoro.

Contemporarily Italian surgery made great progress in this century, and also in this field Padua had some of the best known surgeons as teachers. Among these it will suffice to mention the names of Fabrizio d'Acquapendente, the anatomist, who enjoyed the fame of being the greatest Italian surgeon of his time, and Giovanni Antonio Della Croce who published in Venice in 1573 a book which had a widespread sale, and was considered the classical text on surgery for more than two centuries. The description of trepanning in cases of wounds of the skull forms an important chapter of this book in which all instruments which are necessary for these operations are reproduced.

This scientific movement of progress in all fields of medicine, of which I have endeavored to give a picture in its most important expressions, found its climax when at the beginning of the fifteenth century, Padua being ahead of the scientific progress, the gigantic figure of a man arose who impressed on the whole historic epoch the mark of his individuality. Galileus Galilei, discovering the telescope and the microscope gave two mighty weapons to research and was the founder of experimental science.

At the time in which a great passion for studies, a great love of beauty, and inexhaustible desire for glory vivified all the works of the Italians, Padua was the most important center of scientific research. Here came teachers and students from all parts of Europe, here the astronomers searched the secret of the stars, the physicians the mystery of life, the mathematicians the most difficult problems of geometry and of algebra: from Copernicus to Galileus, from Vesalius to Fabrizio d'Acquapendente, from Colombo to Fracastoro, physicians, politicians, lawyers, physicists, naturalists and mathematicians prepared and accomplished the Renaissance of Science. In Padua the great international currents met; the far-seeing protection of a wise government preserved the freedom of teaching and of learning as a great treasure.

How important a part foreign students had in the life of the university and particularly in the school of medicine, is demonstrated by the books of the foreign nations in which their Consiliarii noted the most important happenings. Sometimes the representative of the students complained before the authorities because the lectures were not regularly delivered. In the year 1587 a few national groups were represented in the Natio Alemanna, that is the students from Switzerland, Bohemia, Denmark, Flanders and Poland, and each group chose its representative. The Consiliarius of the Natio Alemanna had the right to hold the matricular book and he had first place in all the ceremonies of the university, two votes in all meetings and the right to bear the sword. The English students were so numerous that in 1534 the Natio Anglica divided itself from the Scota: in 1603 the English, the Scotch and the Irish are again united in the English nation. This nation had its own councillor, a beadle and a secretary (*cancellarius*); it possessed also its own library and special privileges.

The influence of Padua on English medicine during the Renaissance is undoubtedly very important. I do not know whether it is really possible to limit the Italian influence on English scholarship to a definite period of time, that is from the beginning to the end of fifteenth century, as Lewis Einstein* thinks; surely throughout the whole Renaissance we find in English literature many quotations which demonstrate that at the Paduan school British scholars were very common. Many Oxford men crossed the Alps during the fifteenth century: Vicenza and Vercelli had English rectors: the new spirit of the Renaissance had effected a revolution in the intellectual world, and Oxonians went to Italy in search of the new Humanism. I may mention one of the most renowned of the English scholars of Italian Universities: John Tiptoft, Earl of Worcester, who was known in the whole of Italy for his scholarship and was considered, as Einstein says, the first example of an "Italianate Englishman." He had gone to Padua to continue his Latin studies and he is said to have caused Pius the Second to weep with joy at hearing such eloquence flow from English lips. Thomas Linacre came to Italy in 1488, became in Florence the friend of Lorenzo dei Medici and of Politian, graduated as a doctor of medicine at Padua and called Italy "Sancta mater studiorum." He was the first great Humanist and the foremost physician of his time, and was considered by Erasmus the introducer of medical science into England. In London he became Court physician with John Chamber, who had also studied medicine at Padua. He was the founder of the College of Physicians in London modelled on Italian institutions.

The efforts of the group of Oxonian scholars at Padua succeeded in establishing the new learning at Oxford and in extending the Italian influence in England. The famous Doctor Caius had also been a scholar at Padua and he founded at Cambridge a Medical College, which still bears his name.

The reputation of Padua as a center of learning was popular in England from old times.* Geoffrey Chaucer, who was in Lombardy on a diplomatic mission about 1372, quotes Padua in the prologue to "The Clerkes Tale":

I wol you telle a tale which that I
Lerned at Padowe of a worthy clerk. . . .
Franceys Petrark, the laureat poete.

Every alumnus at Padua prided himself upon his academic distinction and defended his peculiar Latinity. George Chapman in his comedy "All Fools" lets Costanza say:

You have a younger son at Padua
I like his learning well—make him your heir.

In the first scene of "The Taming of the Shrew" Shakespeare pays his tribute to Padua. Lucentio explains the motive of his journey:

For the great desire I had
To see fair Padua, nursery of Arts . . .
I am arrived . . .
And haply institute
A course of Learning and ingenious studies
And therefore Tranio . . . I have Pisa left,
And am to Padua come, as he that leaves
A shallow plash to plunge him in the deep.

But the fame of Padua as a center of learning did not cease with the end of the Renaissance. It may be of some interest to quote here the first contact of one of the most prominent American physicians with the Paduan School. John Morgan, born in Philadelphia in 1735, where he received the degree of A.B. from the College of Philadelphia in 1757, went to Europe in 1760 to pursue his medical study. He spent five years in Europe and when he came back to Philadelphia delivered his famous "Discourse upon the Institution of Medical Schools in America" (1765), which was the most important contribution to the foundation of medical schools in the United States. In his "Journal" he tells of his visit to Morgagni, in July 1764. Morgagni showed him many interesting preparations, told him of his new discoveries and

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* Einstein, L. The Italian Renaissance in England. New York, Columbia Univ. Press.

* Spielman, M. H. The Iconography of Andrus Vesalius, 1514–1564. London, 1925.

> . . . He was so good as to do me the honour of making me a present of his late publication, two volumes in folio "De sedibus et causis morborum," of which there have been three different editions within the three years, being in the highest estimation throughout all Europe, and all copies of the late edition already bought up.

Very noteworthy is the importance in Padua of the Polish students, especially in the sixteenth century when after the spread of the Reformation in Germany it was necessary for the Polish students to go to Italy in order to complete their studies. Between the years 1544 and 1550 a great part of the teachers of the university of Cracow went to Padua, leaving their schools; a Polish historian notices that often there is to be found in the acts of episcopacies of this time, near the name of certain high clergymen, the remark "Proficiens in Italiam studii gratia" (gone to Italy in order to study). In the high places of the kingdom only those who had studied at Padua could be accepted, and we can calculate that the number of Polish students in Padua in the second half of this century was more than 1500. Nicolaus Copernicus, the great astronomer, was a student at Padua from 1501 to 1504 and regularly matriculated in the Faculty of medicine; there seems to be little doubt that the discovery of the heliocentric system of the Universe can be dated from Padua.

Padua was the foremost school for non-Catholic students to whom inscription in the university of Cracow was forbidden. The greatest Polish physicians of the Renaissance were pupils of the Paduan university: Joseph Struthius, who was physician of the King Sigmond August of Holland and was considered one of the most learned men of that country, was one of the most illustrious Paduan pupils.

Not less important was the part of French students; Monsieur de Montaigne tells us in his diary that in 1580 more than 100 French gentlemen lived in Padua in order to frequent the schools.

The government of the Republic defended with the greatest authority the rights of the students who could freely send embassies to the Doge of Venice. When Pope Pius IV published the Bull "In sacrosancta" which prohibited non-Catholic students from obtaining the degree in medicine which was then conferred in church and in the presence of the ecclesiastical authorities, the graduate taking the oath on the gospel, the Republic instituted the conferment of degree by the authority of the college of physicians, and to the energetic protest made by the Vatican, Venice answered through Fra' Paolo Sarpi, the renowned scientist and Councilor of the Republic, that it was not thought necessary that an excellent physician should be profound in theology.

The old Paduan University had thus assumed with great dignity a political function. It had seen the transformation of the hall of an old inn called Il Bo', namely at the Sign of the Bull, a name which among the university students is current to this very day, into the magnificent historical hall in which thousands of inscriptions and of coats of arms tell the stories of masters and students. At the end of the sixteenth century a great international current started from Padua to all the important centers of culture in the world.

The bright epoch began in Padua with the work of Pietro d'Abano, a physician and philosopher, had its climax with Andrea Vesalius and Girolamo Fracastoro, the founders of anatomy and pathology, and closed with the work of Galileo. These physicians of the Renaissance, who were at the same time humanists, men of letters and artists, saw with prophetic mind the solution of the great problems of life; the great blind man whose doctrines were solemnly condemned by the High Court of the Holy Office of the Inquisition in Rome had seen beyond his time and beyond the limits of human knowledge; he affirmed that the laws of nature are written in mathematical characters and that in order to achieve the truth it is first necessary to put experience before any discussion. From the Padua of the Renaissance, from the university where anatomical and physiological teaching had had the most important success, the beginning of experimental science was initiated.

A SHORT REVIEW OF THE

DEVELOPMENT OF MEDICAL EDUCATION AND SCHOOLS OF MEDICINE*

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MODERN medical teaching, with all of its highly organized complexity and efficiency, is so familiar to us that we tend to forget how recent this development really is, and just what the conditions were which preceded it. But if we consider even briefly the evolution of medical education and medical schools, we see that they have passed through many phases of growth before attaining their present status.

Perhaps the earliest attempt to gather information in regard to the treatment of disease, of which there seems to be any record, was the Babylonian custom of bringing the sick to the market-place, where the passers-by conferred with the sufferer and advised him in regard to the treatment of his disease. In this way, 4000 years or more ago, a system of empirical therapeutics developed, and persons who were especially adept at curing disease became the first physicians; often there was a different physician for each disease. The therapeutic code was preserved on clay tablets by the priests and was entirely anonymous; for, while the names of several Assyro-Babylonian physicians are known, there is no definite information concerning the names of any authors or teachers, nor do we know any details regarding their training.

The earliest medical schools of which we have any account were the temple schools of Egypt. These were under the supervision of the priests, and certain members of the priesthood were assigned to the teaching of the natural sciences and medicine. The origin of these schools is not known, and there seems to be no record of the names of the individuals who taught in them. It is known, however, that some experimental work was carried on, as the Ebers and Smith papyri contain information that could have been obtained only by animal experimentation. It is probable that the students received the greater part of their training by being apprenticed to a physician and by assisting him in the care of the sick. The science of medicine did not make much progress in these Egyptian schools. Wherever the teaching of medicine was in the hands of the priesthood it soon became so identified with ritual and tradition that progress was impossible; therefore, Egyptian medicine failed to fulfill its early promises of scientific development.

The earliest teaching of medicine in Greece was also to a great extent a development of the temples, and it was not until a few lay teachers made their appearance that there was any real advance. Where one or more of these individuals expounded their own particular theories of the doctrines of medicine, or where some individual physician was an especially interesting teacher, students soon gathered, and in this way small groups were formed.

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* Given as a lecture in the course on the History of Medicine at Vanderbilt University Medical School.

These groups became the nuclei of the first medical schools. The Greek schools were among the earliest examples of this type and the greatest of these was the School of Cos, where Hippocrates was the guiding spirit. A teacher during this period, and indeed for many centuries thereafter, undertook the entire medical training of the student who paid him an honorarium for his services. Often the pupil was a son or near relative, as the art of medicine was frequently passed down to many members of the same family for generations. There were no specialists, and the same teacher gave instruction in surgery and internal medicine. There were nursing homes, or Iatreia, in which the students assisted in the care of the sick, and these homes were often attached to the physician's residence.

The year 331 B.C. saw the founding of the University of Alexandria, which was one of the greatest schools of all times. Here a brilliant galaxy of scientific teachers, among whom were Euclid, Archimedes and Hipparchus, carried out many epoch-making investigations. Medicine was taught in a school connected with the museum. This edifice was composed of both study halls and sleeping apartments for students. Lofty halls for meals and great libraries containing hundreds of thousands of papyri were provided. At Alexandria, the medical students had, for the first time, a really good opportunity to study anatomy, as the Egyptian kings placed at their disposal human bodies for dissection. Galen mentions naively that of all the treasures of the museum, the one which appealed to him most was a complete human skeleton. For several centuries the teaching of medicine and the allied sciences was carried on in the University of Alexandria at a higher level than it was to attain again for many generations. Anatomical investigation made great strides under Herophilus and Erasistratus, but unfortunately their followers neglected independent investigation and held fast to the theories which had been handed down to them. Later, the Ptolemies withdrew their benevolent protection, and, even while Galen was a student at the university, it was evident that the decline had begun.

During the early years of the Christian era, medical teaching on the scale developed by the Greek schools was practically non-existent in Europe. It was almost entirely in the hands of clerics and monks. The schools were attached to the residences of the Bishops or to the monasteries. Frightful limits were imposed on independent investigations; human dissection was not permitted; and the student who undertook the dissection of animals ran grave risk of being persecuted for practicing magic.

The task of transmitting the art of medicine during this period was carried on better in the Orient, where in Bagdad there were two great clinical teachers, Rhazes and Avicenna. Anatomy and physiology did not advance beyond the doctrines of Galen, but, in the numerous hospitals which had been built under the Caliphs, the students had splendid opportunities to study the manifestations of disease.

During the ninth century A.D. a lay school of medicine in Salerno, Italy, was rapidly becoming famous. There seems to be no authentic information regarding its origin, but it seems certain that both Arabic and Greek influences played a prominent part in its development. While some of the teachers were priests, they did not have the exclusive right to teach as was the case in so many schools of this period. Persons from any nation and of any religion had access to the lectures and even sex was not a barrier, women being admitted both as students and as teachers; the best known of these was Trotula. The school flourished during the eleventh and twelfth centuries, and during this period Salerno was virtually the medical center of Europe.

Another famous medical school of the medieval period was Montpellier in France. The origin of this school is also shrouded in obscurity. At Montpellier, as well as at Salerno, it is certain that Arabic influence played an important part in its development. Garrison gives the date of the founding of the school of Montpellier as about 738. The fame of the physicians who practiced and taught there and of the cures they wrought spread throughout Europe during the eleventh and twelfth centuries. This school was enormously important during the Middle Ages and is still in existence.

With the beginning of the thirteenth century, medicine was introduced as part of the regular curriculum of the universities and there was less necessity for special schools. Where they did exist, they were inferior to the university schools. The universities of Paris (1110), Bologna (1158) and Oxford (1167) were founded in rapid succession. They were followed by Cambridge (1209), Padua (1222), Prague (1348), Vienna (1365) and Heidelberg (1386).

With medicine firmly established in the universities, it is interesting to note the average medical curriculum of the medieval period. In many respects it was inferior to that afforded by the older Hellenic and Oriental schools. In the Greek schools, medicine had been largely taught by the direct transmission of experience from the practicing physician to the student. From the tenth until the eighteenth century, this type of teaching came to be almost excluded from the curriculum. During the Middle Ages the universities crystallized the study of medicine into dogmatic theories based chiefly on the teachings of Hippocrates, Galen and Avicenna, which were taught almost exclusively during the early part of this period.

At first there were no printed books; there was very little practical work in anatomy or at the bedside; the language of the classroom was exclusively Latin, and study consisted largely of memorizing, copying and reading aloud from manuscripts. One treatise on the teaching of medicine from this period suggests that "before going to sleep every student must, like an ox, chew the cud of what he had learned during the day." It was very important for those who went elsewhere to teach to have committed the texts to memory, for it was not practicable to carry the parchments with them and they might not be available at another school. In 1395 the medical faculty of Paris possessed only nine medical works, and it is said that when King Louis XI wished to borrow one of these precious treasures, in order to have it copied, a meeting of the Faculty was called, and permission was granted only after the king had deposited twelve marks in silver as "caution money" and granted the University a loan of one hundred thalers in gold. The texts were discussed and the skill of a teacher depended on how well he could memorize and defend some particular dogma. Finally, the disputations became an end in themselves and the poor learned doctors went forth to sham battles of words just as their brothers in arms, the knights, did to tournaments. The result of all this was that practically no research was carried on and medical knowledge remained almost at a standstill except for the development of certain empirical systems of therapeutics.

The Italian schools were apparently among the first to revive the study of anatomy, neglected since Alexandrian days. In 1308, the Council of Venice decreed that the medical college should undertake one dissection each year, but even down to 1500 dissections on the human body remained rare occurrences. The special permission of the Pope and secular authorities had to be obtained, and only the bodies of executed criminals were used. Human dissection was still opposed from the standpoint of religious, political and social prejudices. At Montpellier, after 1376, dissections were performed at least once a year. The dissection of female bodies was prohibited until 1452. Students who witnessed two dissections on human bodies during their years of training were fortunate. The word "witnessed" is used advisedly, since the professors alone took an active part in the dissection. Dissections on animals, however, were fairly frequent, pigs, bears, monkeys and dogs being used.

The Greeks had realized that the art of surgery should be taught along with internal medicine, and they emphasized the importance of this branch of medicine. But during the Middle Ages, due largely to distaste for the practical forms of medicine, the art of surgery fell into disrepute. Those who followed it were looked down upon, and this finally went so far that at the University of Paris in 1350 it was decreed that members of the faculty and students must abstain from the practice of surgery, which for a time passed largely into the hands of the barbers. The struggle between the physicians and surgeons continued until the beginning of the eighteenth century. At Montpellier, surgery was at first taught along with medicine, but gradually such feeling developed among the students that battles took place between them on many occasions; lectures had to be arranged in such a way that, if possible, the two groups did not even meet each other as they went to and from their classes, the surgical students being limited to the use of one street and the medical students to another.

The medical faculty often consisted of only one or two professors: one who taught the "institutes" or theory of medicine, which finally included botany, anatomy and physiology, and another who taught "practice" (therapy), including pathology and therapeutics. The salaries of the professors were usually from thirty-five to fifty dollars a year.

The medical schools of this period, in spite of many handicaps, set up lofty ideals of medical education. The medical student was expected to complete sufficient university work to receive the Bachelor of Arts degree before he entered upon his medical career. Then, after two or three years of medical study, he became a Bachelor of Medicine. However, he was not allowed to practice independently until he had completed further studies, which lasted another two or three years. These requirements were enforced by law; one of the earliest and most important was the edict of Frederick II in 1224.

Having completed in all about seven years of medical work, the student then had to pass an extensive examination. The examinations were rigorous in the extreme. First came preliminary examinations which lasted eight days; during this time the student was each day assigned a new thesis, upon which he had to speak for at least an hour on the following day. Finally, after a respite of several days, he had to discuss two additional theses from noon until four o'clock, after which he had to undergo questioning by the professors. When this ordeal was passed, he became a Licentiate and could practice or teach medicine. In order to obtain the degree of Doctor of Medicine, he had to pass a few more examinations, and the conferring of the degree of "Doctorate" was appropriately called the "actus triumphalis." The presentation ceremonies were very interesting. They took place in church, with bells sounding all the time. The recipient of the degree was led forth by the faculty and spectators to the sound of music. There were many Latin discourses. He was presented with a cap, a ring of gold, a belt of gold, and a volume of Hippocrates, and finally he was made to sit beside the Chancellor, or President, who kissed and blessed him. The student bore the expense of the ceremony, including gifts of gloves to all members of the faculty, and sometimes an entire suit of clothes to a particular teacher. This cost was so heavy that often the student preferred to practice as a Licentiate rather than to incur it. The work required of medical students, the exact methods of examination, and the ceremonies connected with them, naturally varied to some extent in different countries and universities.

For nearly two centuries there were no important changes in the methods of teaching medicine, but many courageous investigators were paving the way for later developments. During the sixteenth and seventeenth centuries the yoke of tradition was being thrown off, at least in regard to restrictions on independent research. Real advances were being made, especially in anatomy and physiology, which had been revolutionized by the epoch-making work of Vesalius and Harvey.

The eighteenth and ninteenth centuries were periods of change and fluctuation in educational methods which gradually inaugurated the modern era in medical teaching. Up to this time, as we have seen, there were no specialists in teaching; the faculty had consisted of one, two and sometimes three professors. Now this number increased to from four to six, but the subjects were still taught in combined courses given by the same man and sometimes covered such curious assortments as anatomy, botany, chemistry and physiology. The term for such courses, "Institutes of Medicine," still persisted. The professors interchanged subjects, one man teaching a subject for a while and later teaching some other; each man was thought to be entirely capable of conducting all courses in the field of medicine equally well.

During the eighteenth century, practical work in anatomy was greatly increased; materials and facilities for dissecting became part of the equipment of medical schools, although the material was still acquired with great difficulty, and in many instances was procured through the efforts of grave-robbers. Legislation was passed, toward the beginning of the nineteenth century, by which bodies of criminals and unclaimed persons were granted to the schools for purposes of dissection. With advances in anatomy, the art of surgery progressed and, at last, at the end of the eighteenth century, physicians and surgeons were once more on an equal footing and the same preliminary training was required for both.

Practical work was introduced into the study of materia medica by instruction in botanical gardens attached to most of the universities, and by work in apothecary shops. Finally, one of the most important changes of all, the lecture rooms were released from the oppressive atmosphere of droning Latin, and lectures were given in modern languages.

Another enormously important development in teaching was the introduction of systematic clinical instruction by practical bedside demonstrations in place of the purely theoretical method which had preceded it. The University of Leyden in Holland was the first to have a clinic for teaching purposes; this was directed by Boerhaave, and in 1745 by his pupil, Van Swieten, who was subsequently called to the University of Vienna by the Empress Maria Theresa, where he established a clinic modelled on that at Leyden. It was due largely to Van Swieten's influence that Vienna became for a long time the pattern for all clinical schools, and remained in the front of advanced medical education for the next century. It is interesting to note that this teaching hospital or clinic, as it was called, consisted of twelve beds, six for men and six for women. It was supplemented by ambulatory patients who came to the clinic for treatment. For the first time, systematic autopsies were performed on patients dying in the hospital.

The dawn of the nineteenth century found specialization in teaching an established fact. Vienna, for instance, possessed nine regular professorships. In 1908, after revisiting Vienna, Sir William Osler wrote a delightfully whimsical letter, which was published in the *Journal of the American Medical Association*, in which he outlined the development of medical education as follows:

> Minerva Medica has never had her chief temple in any one country for more than a generation or two. For a long period at the Renaissance she dwelt in northern Italy, and from all parts of the world men flocked to Padua and Bologna. Then for some reason of her own she went to Holland, where she set up her chief temple at Leyden with Boerhaave as high Priest. Uncertain for a time, she flitted here and there. For the first four decades of the nineteenth century she lived in France . . . then Rokitansky and Skoda rebuilt for her the temple at the new Vienna school. . . . In an interview most graciously granted to me as a votary of long standing . . . I boldly suggested that it was perhaps time to think of crossing the Atlantic, and setting up her temple in the new world for a generation or two. I spoke of the many advantages, of the absence of tradition—here she visibly weakened, as she has suffered so much from this poison—the greater freedom, the enthusiasm, and then I spoke of missionary work. At these words, she turned on me sharply, and said: "That is not for me. We gods have but one motto—those that honor us, we honor. Give me the temple, give me the priests, give me the true worship, the old Hippocratic service of the art and of the science of ministering to man, and I will come. By the eternal law by which we gods live, *I would have to come*. I did not wish to

leave Paris . . . where I was served so faithfully by Bichat and Laennec. . . ." Tears filled her eyes, and her voice trembled with emotion, "but where the worshippers are most devoted, not mark you, where they are the most numerous; where the clouds of incense rise highest, there must my chief temple be, and to it from all quarters will come the faithful flock. As it was in Greece, in Alexandria, in Italy, in France, so it is now in Germany, and so it may be in the new world I long to see."

In the American Colonies during the eighteenth century virtually pioneer conditions prevailed. There were no established schools for medical teaching and the young American who felt called to a medical career had to return to Europe for training in order to supplement the purely practical apprenticeship instruction which was offered him by the physicians engaged in practice in the Colonies.

The first formal course in medical science took place in Philadelphia. Thomas Cadwalader, who was later a physician on the staff of the Pennsylvania Hospital founded in 1751, conducted a series of lectures in anatomy in about 1730. His course was followed by demonstrations in anatomy given in New York and Newport, Rhode Island. In 1762, Doctor William Shippen gave a course in anatomy at his father's house in Philadelphia. This took place at 6 o'clock in the evening, tickets for which were 5 pistoles (about $17.00) each. Those who wished to learn the art of dissecting and injecting, etc., had to pay 5 pistoles more. In 1762, Dr. Shippen also gave a course on "midwifery," the first to be given in this country. Dr. Shippen had received his early training in Philadelphia as an apprentice to his father, and then went to Europe for further work, including the study of anatomy and midwifery with John and William Hunter.

In 1760 Dr. John Morgan of Philadelphia, who had studied and practiced medicine for over ten years, went to Europe and spent five years under some of the most celebrated masters in medicine. Apparently he distinguished himself in many ways, and was admitted to membership in many of the important European medical societies. During this period of study, Morgan was formulating the idea of returning and establishing a "school of physic" in his native city rather than resuming his private practice. This plan was discussed with Doctor Shippen while they were both in Europe, as well as with Doctor John Fothergill of London, who heartily approved and in 1762 sent a gift of a number of cases of anatomical drawings and preparations to the Pennsylvania Hospital.

The need for an institution for medical education was acute. In spite of the fact that undoubtedly many fine and honest men were practising medicine, the necessity for reform was urgent. Packard, in his fascinating "History of Medicine in the United States," says that "there were some 3,500 men in practice in the colonies, of whom only 400 held medical degrees." There were practically no laws regulating the profession, quacks abounded, and, as there were no examinations and licenses required, anyone who so chose could set himself up as a physician, apothecary or surgeon. Therefore there was some foundation for the criticism of visiting English physicians who reported that medicine was so poor in the Colonies that it was better to let nature take her course than to trust to the practitioner, there frequently being more danger from the physician than from the distemper.

Morgan's plans finally bore fruit, and he proposed to the Board of Trustees of the University of Pennsylvania that they add professorships in the medical sciences to their faculty. He prevailed on the Board to accept his proposal, and thus the first medical professorship in America was created in 1765, when Dr. Morgan was appointed as Professor of the Theory and Practice of Physic. A month later he delivered his inaugural address upon the "Institution of Medical Schools in America," an address which has justly become famous because it contained a programme for medical education so far-seeing and broad in outline that only now are its prophecies being fully realized in the development of American medicine. Dr. Shippen was appointed Professor of Anatomy in September, 1765, and for two years these two men gave all the lectures; Dr. Shippen taught anatomy and physiology, Dr. Morgan, botany, chemistry, materia medica and the theory and practice of physic. These courses were supplemented by clinical lectures given by Dr. Thomas Bond at the Pennsylvania Hospital, and in this way was inaugurated the close relationship between the college and the hospital which has existed up to the present time. In 1768 Dr. Adam Kuhn was appointed Professor of Materia Medica and Dr. Benjamin Rush Professor of Chemistry. The faculty now consisted of five men, all but one of whom were between twenty-four and thirty-four years of age, and it was due to the zeal and enthusiasm of these young men that the infant of American medical education survived the first two turbulent decades of its existence. According to most authorities, the graduates from 1768 to 1789 varied from two to ten a year; in 1868 they numbered 153. Men whose names are famous in the annals of medical history in America served on the faculty, and the school held, and still holds, a place in the first group of American medical schools.

One cannot leave a discussion of early medicine in Philadelphia, however, without mentioning Dr. Abraham Chovet, one of the most picturesque physicians and teachers of that period. Dr. Chovet had brought from England a collection of wax models and anatomic preparations upon which he lectured during the winter of 1774–1775. Dr. Chovet, in the announcement of his lectures, drew attention to the advantages of his collection of anatomical wax-models as follows: " . . . this course cannot be attended with the disagreeable sight or smell of recent disease and putrid carcases, which often disgust even the students in Physik, as well as the curious otherwise inclined to this useful and sublime part of natural philosophy. . . . " Considering the conditions prevailing in even the best European dissecting rooms of that period, doubtless many preferred Dr. Chovet's models.

In 1768 a medical department was started in King's College, now Columbia University; this was later amalgamated with the College of Physicians and Surgeons. Dr. Samuel Bard was Professor of Theory and Practice of Physic, and was head of the faculty for several years, and to him is due, in large part, its success. The College of Physicians and Surgeons played an important part in the development of medicine in New York, and its recent reorganization represents one of the most extensive enterprises in modern medicine.

In 1783 the president and fellows of Harvard University decided to establish medical professorships at that college. Dr. John Warren was appointed Professor of Anatomy and Surgery, and, as the first of the professors elected, he was to supervise the running of the other branches as well; in other words, he was to act somewhat as a Dean does at the present time. Benjamin Waterhouse was chosen Professor of the Theory and Practice of Physic, and Aaron Dexter, Professor of Chemistry and Materia Medica. To the zeal and energy of Doctor Warren the success of this new venture in medical education was largely due. He carried out his courses under difficulties which would have proved overwhelming to many.

Professor Waterhouse, the Professor of Physic, was instrumental in introducing vaccination into this country in 1799 and is often called the Jenner of America. He obtained some virus from England and vaccinated his son. This was the first vaccination to be performed in this country, although inoculation had previously been introduced in 1721 by the Rev. Cotton Mather and Doctor Boylston. Dr. Waterhouse also wrote an essay on the subject of vaccination.

One of the regulations regarding the admission of students to the Harvard medical school was amusing; namely, that lectures were to be open to students whether they had had a college education or not, but undergraduates would not be admitted until they had two years' standing in the college and the consent of their parents had been signified to the President in writing. Students of two years' standing and over twenty-one years of age were exempt from this regulation. Evidently they believed in taking no chances with the youth entrusted to their care.

The salaries of the professors during these early years were modest in the extreme, and Waterhouse, when he resigned, stated that for a period of several years he had received no salary and at no time had it exceeded $400. These medical professorships were supported entirely by the fees the students paid and by a few bequests. Ezekiel Hersey left the sum of 1,000 pounds for the Chair of Anatomy and Surgery, and later Major Erving gave a similar amount for the Chair of Chemistry and Materia Medica. In fact, during the period from 1782 to 1810, the total endowment available for the medical school was less than $20,000, yielding an income of about $1,100 a year. When compared with the modern medical endowments, it seems incredible that these men should have attempted, much less carried out, their program with such limited funds.

At first the school was housed in Harvard Hall at Cambridge and, since there were no hospital facilities at Cambridge for teaching purposes, practical clinical experience had to be obtained by apprenticeship with the general practitioners during the summer months. In 1801 the fee for a degree in medicine was $7.00, if the student had taken his Master of Arts, and $24.00 if he had not. Lack of clinical facilities finally caused the medical school to be transferred to Boston in 1810, where it occupied temporary quarters until its own building was completed in 1816. From 1816 until 1847 it was known by the name of Massachusetts Medical College, in recognition of gifts from the state. The rapidly growing school had a succession of homes until the present buildings were erected. It is, however, impossible to follow the entire history of the Harvard University Medical Department or to discuss at length the men who taught there. Some of the most interesting were Dr. Oliver Wendell Holmes, Dr. Henry J. Bigelow, and the son and grandson of Dr. John Warren.

Another school founded before the dawn of the nineteenth century did not, unfortunately, have the subsequent brilliant development of Pennsylvania and Harvard; yet certainly it occupied an important place in medical education for a period, especially in the Southwest. This school was Transylvania in Lexington, Kentucky. The medical department was organized in 1799, with only two professors, Dr. Samuel Brown and Dr. Frederick Ridgely; these professors were the first to teach medicine west of the Allegheny Mountains. The school was at first carried on under pioneer conditions, as good roads were non-existent and the buildings were poorly equipped. In 1820, when one of the professors set out to purchase books and apparatus in Europe for the medical college, the first part of the trip had to be made on horseback, and so deep and adhesive was the mud that it took four days to go sixty miles. The Library of the Transylvania Medical Department contained about five thousand volumes, every one of which had to be carried over the mountains in saddle bags slung over the backs of mules.

The fame of Transylvania increased rapidly and attendance grew from twenty students in 1817 to 200 in 1824. This rapid growth was due in part to the difficulty of the journey to the Eastern medical schools. A more important factor, however, was the reputation of the members of the teaching staff, which included some names famous in the history of American medicine: Benjamin Dudley, Charles Caldwell, Daniel Drake, John Eberle, and Elisha Bartlett. The lectures of these men drew students from all over the South and West. With the increased accessibility of the larger medical schools in the East, and the retirement of some of the most distinguished teachers, the number of students gradually decreased, until in 1859 the Medical Department of Transylvania closed. The academic departments were carried on for a few more years, when the buildings passed into the hands of another institution, and Transylvania is now but a name.

These early medical schools were attached to universities and were considered essentially a part of them, and this connection guaranteed certain standards and ideals of education. During the first half of the nineteenth century, however, private medical schools, many of them purely money-making ventures, grew up in great numbers. Flexner, in his review of medical education in the United States published in 1910, found that during a little more than a century 457 schools had opened in Canada and the United States, of which many, of course, were short-lived, and many could scarcely be called schools at all. Flexner cites 42 in Missouri and 18 in Tennessee. Morgan's ideals of education had been forgotten. An occasional dissection, a box of old bones and a skeleton consituted the equipment for anatomical teaching. There was no laboratory equipment, and the teaching was wholly didactic. Students received their degrees at the end of a year's work in some places, and there were no definite requirements as to preliminary education. This finally terminated in the "Diploma Mill" scandals of the 1880's and 1890's, when it was found that fraudulent institutions were incorporated for the sole purpose of selling medical degrees by mail. In a review of this situation made for the *Journal of the American Medical Association*, twenty-one active diploma mills were reported as still in existence in 1894.

Due to the activities of various State Health Boards, conditions began to improve, but in 1906 there were still 162 medical schools in the United States. In 1909, the Council on Medical Education of the American Medical Association adopted a minimum standard of medical education. The effect of this definition of standards and the stressing of the necessity of premedical college training was a marked decrease in the number of medical schools. In 1910 the number had dropped to 131. How much conditions have bettered since that time is shown by the fact that today we have 76 Grade A medical schools, 10 of which are two-year schools, and it is evident that those which failed to measure up to the standards set by the American Medical Association's Council on Education have ceased to exist.

The first real reform in American medical education was made in 1871, when Charles W. Eliot, president of Harvard, overcoming much opposition, raised the entrance requirements and lengthened the course to three years. With the opening of the Johns Hopkins Medical School in 1893, for the first time in the United States a degree of Bachelor of Arts or Science was required for admission. Everyone was skeptical in medical circles, and even the faculty wondered if any students would apply. Dr. Welch quotes Osler as saying, "Welch, it is lucky we get in as professors: we never could enter as students." But eighteen students, three of whom were women, began work that autumn.

As is always true in regard to the successful accomplishment of any new project, it is the personal factor that counts, and the tremendous contribution made by Johns Hopkins was possible because of the wisdom and forethought of Daniel Gilman, first President of the University. He realized that medical education could not be maintained at a high level on a simple didactic basis, but must be combined intimately with research. With this idea in mind, he selected the small group of men who formed the first faculty of the Johns Hopkins Medical School. They were William H. Welch, William Osler, Franklin P. Mall, John Jacob Abel and William Stewart Halsted. These men had been trained in the best traditions of medical research in the European centers. They brought to Johns Hopkins the fundamental view that research is an essential part of every good teacher's equipment; that in order to stimulate others, members of a medical faculty should be vitally interested in some fundamental problems pertaining to medicine and actively engaged in their solution, and that only under such conditions can they possibly exert maximum influence as teachers. The development of this theory at Johns Hopkins has made this school a most potent factor in medical education during the last forty years. In the organization of new schools this idea has been borne firmly in mind, and today active research is carried on in most of the medical schools in the United States.

With the introduction of laboratory methods, necessitating an enormous amount of expensive equipment, and faculties consisting of highly trained research workers and teachers, it is at once evident that the fees paid by the students are totally inadequate to meet the expenses, and the necessity of endowment becomes of tremendous importance. Gifts from individuals and foundations have made possible the development of such schools. But the cost of maintaining medical institutions continually mounts. The Report of the Commission on Medical Education, recently published, gives an increase in budgets of many schools from 200 to 1000 per cent during the last fifteen years.

It is very difficult to analyze all of the complex trends of modern medical education, and impossible to determine which of them represent the specific phases which are most likely to initiate advantageous developments beyond the present medical structure. There are several developments, however, which are quite obviously important, and which may be the foundations upon which further medical development will be built. One striking tendency following medical development is that of the closer physical and intellectual relationship between the various departments in the medical school. The development of the new schools at Vanderbilt and Rochester have particularly emphasized this point in their method of construction and in the attitude of their staffs. This idea has been further extended and developed in the two medical centers in New York City, the College of Physicians and Surgeons, and Cornell. Such an organization in which the preclinical and clinical departments are brought together both physically and intellectually with the hospital units furnishes a tremendous additional stimulus to the development of inter-departmental research and brings many different viewpoints to bear on the problems of teaching medical students.

One of the modern trends which should be mentioned is the widespread development of more adequate teaching in Public Health, Preventive Medicine and Hygiene. The intimate association of medical schools with city and state health departments, the organization of special departments for this subject, and the development of institutes and separate schools has been one of the major items of medical progress during the last ten years. That this development will proceed still further and eventually assume a tremendously important rôle in medical education is to be expected.

Another development which is in its infancy but which will probably result in important reforms in teaching is the unrest which is evident in medical schools in the organization and reorganization of their curricula. Several important institutions have reduced the length of their courses very materially, and have introduced a system of electives which breaks up at least to some extent the lock step which has so long dominated medical education. In purpose this development looks forward to some rational adjustment of medical curricula to meet the enormous expansion that has occurred in medical subjects and to make possible the teaching of these extensive additions to medical knowledge within the four years generally allotted to medical education.

It has been suggested that individual instruction should be substituted for the type of group instruction which is now current. Some such effort has been made in one or two institutions but the experiments have not as yet proceeded for a sufficient time to make analyses useful. It seems quite certain, however, that in the dissatisfaction which has been manifested by medical faculties in regard to the character, arrangement and content of curricula, that the seeds of future development have been planted, and that this development will undoubtedly bring forth some type of progress to the improvement of medical education. Such changes are in the formative period and will in the coming decade produce results as yet only dimly forecast in the minds of those who are concerned with them.

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BIRTH OF THE FIRST INDEPENDENT PROPRIETARY MEDICAL SCHOOL IN NEW ENGLAND, AT CASTLETON, VERMONT, IN 1818

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CLEVELAND, O.

The Background

WHILE the American medical schools of the eighteenth century were all departments of colleges of arts, American medical education of the early nineteenth century was characterized by the rise of a type of medical school which had no connection with any other educational institution. The first of these was the College of Physicians and Surgeons of the City of New York organized in May, 1807 by the local medical society, with each of its one hundred and one members made a trustee under the charter. In December of the same year the Medical and Chiurgical Faculty, the state medical society, of Maryland established the College of Medicine of Maryland, the second school of the independent type. It became the nucleus of the University of Maryland. Each of these schools was under a medical society.

Later there appeared a yet more independent type of school chartered by a few individuals and unattached to any educational institution or to any medical society. A further variation was that many of these independent medical schools were located in country towns and villages. This was possible since the medical course of that time contained no clinical teaching with patients, the student securing his clinical instruction from his preceptor in the intervals between the annual fourteen-week sessions of lectures at the medical school.

The first small town medical school unaffiliated with a college of arts was the College of Physicians and Surgeons of the Western District of New York, established at Fairfield, Herkimer Co., N. Y., a village of five hundred inhabitants nine miles north of Little Falls, New York. It was chartered June 12, 1812. An important feature of this village was its academy established in 1803, one of those country academies which characterized the early educational system of New England and adjacent states. In this academy, beginning in 1804, was given some instruction in certain elementary medical subjects. In 1809 to its faculty was added a professor of anatomy and surgery, and in the winter of 1812 there were forty-three medical students in the academy. One of the teachers (Josiah Noyes, M.D.) was one of the four founders of the medical college. In its early years the medical college was closely affiliated with the academy.

This medical college, like all other educational institutions of that state, was under the University of the State of New York, under which term is designated the educational department of the state, although it gives no instruction. However, the university granted the degrees recommended by the faculty of the medical school at Fairfield, which received some financial support from the state treasury. Thus this medical college was not entirely independent.

The college at Fairfield had a successful career, graduating 609 men from 1816 to 1840 and having more than twice that number of students who did not graduate. Among its graduates were such eminent men as Nathan S. Davis, founder of the American Medical Association; Asa Gray, eminent botanist; and Alonzo B. Palmer, founder of the Medical School of the University of Michigan.

The independent "country" medical schools nearly all disappeared before 1880 and the history of their type must be pieced together from fragmentary records. There does not exist any adequate historical sketch of any one of about thirty such schools that arose between 1812 and 1860.

NEW ENGLAND MEDICAL SCHOOLS BEFORE 1818

In 1817 each of the five* New England states, except Vermont, had a medical school. In Massachusetts was the Harvard Medical School established in 1782; in New Hampshire was the New Hampshire Medical Institution established in 1797; in Rhode Island was the Medical Department of Brown University established in 1811; and in Connecticut was the Yale Medical Institution established in 1813.

Vermont had then a population nearly equal to New Hampshire, the census of 1820 showing 235,891 and 269,328 inhabitants respectively. While that part of Vermont east of the Green Mountains was near the medical school at Hanover, N. H. the western part of Vermont had no medical school nearer than Fairfield, N. Y. or New Haven, Conn., each about one hundred and fifty miles from the Vermont border, a considerable distance in days when the stage coach was the only public method of transportation. Therefore there appeared to be room for a medical school in western Vermont.

At this time the village of Castleton had less than two thousand inhabitants (1827 in census of 1820). Like Fairfield, N. Y. it had a secondary school known as the Rutland County Grammar School. The location of Castleton within ten miles of the New York border gave promise of securing medical students from that state, and as a matter of fact throughout its life the medical school at Castleton attracted from New York state a considerable part of its enrollment.

THE CASTLETON ACADEMY OF MEDICINE

The writer recently found in the collections of the Vermont State Historical Society the document the text of which appears in this sketch. This permits us to see the intimate details of the origin of one of these country medical schools, and moreover, it is one that, because of its success, came to be a pattern for many other schools of this type. Several of its graduates participated in founding similar schools in the middle western states in later years. It was the first medical school with entirely independent organization, but in August, 1819, it made a very loose affiliation with Middlebury (Vt.) College, a country classical college founded in 1800. Under this affiliation, which continued until 1827, Middlebury College joined in conferring degrees, but had nothing to do with appointment of medical school teachers and no control of the medical curriculum. The property and financial affairs of the medical school were also entirely under the trustees of the medical school, so that it was independent in its operation even during this period of affiliation.

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* There were then but five states in New England since Maine was still the "District of Maine" and a part of Massachusetts, not attaining the dignity of the "State of Maine" until 1820.

It is common history that each of these independent country medical schools arose from the leadership of some one man, usually ably assisted by one other man, while the rest of the participants had quite secondary places in the management of the school. Usually the two leaders, or at least one of them, was a resident of the town where the school was located, while the other teachers of the faculty were imported and were at the school during the term-time only, and frequently for but a part of the term, since a professor would often condense his annual course of instruction into eight, six, or even four weeks. There was frequent change in the personnel of this visiting part of the faculty. Each visiting professor usually occupied a teaching position in some other medical school, often in a distant city. These men made frequent changes in their accessory teaching affiliations. Hence the continuity, policy and character of a country medical school depended chiefly on the one or two leaders.

THE FOUNDERS

It, therefore, seems of interest to give some account of the three men who were party to this document which inaugurated the forty-three years of life of the school at Castleton.

Dr. Selah Gridley (1770–1826). The leader in the organization of the school was Dr. Selah Gridley. He was born June 3, 1770 in Farmington, Conn., of "respectable and pious parents," his father being a deacon in the church of the adjacent town of West Hartford. Little is recorded of his early life. In later years he was morose, introspective, and eccentric and said little about himself. He followed the usual course of that day and studied under a preceptor. Diligent search fails to reveal Dr. Gridley as either a student or graduate in any of the four medical schools existing before 1795. At times the letters M.D. appear after his name, but the bulk of evidence, both direct and collateral, leads to the conclusion that Dr. Gridley did not have a degree in medicine.

Dr. Gridley moved north to Vermont, largely colonized from Connecticut, and in 1795 began practice at Castleton, a village then of somewhat less than a thousand people. On his twenty-fifth birthday he was married to Beulah Langdon of Castleton. Through both his personality and his ability he soon acquired a good practice and attracted a considerable number of apprentices or students of medicine. The date is uncertain when he acquired the ambition to found a medical school, but his own statements indicate it was several years prior to 1818. It is probable that this idea grew out of the founding of the school at Fairfield, N. Y., whither he sent several of his apprentices in its early years.

Dr. Gridley was more than a country physician. In 1801 he established a general store in the village, an avocation not uncommon with country doctors of that period. He was an ardent churchman and of extreme piety. He was much interested in politics. He was a diligent student not only of medicine but also was studiously interested in literature, especially poetry. He frequently uses Latin and quotations from the classics in his letters, and some biblical quotations in Greek.

In poetry he himself indulged. His poems were published posthumously by his brother, Timothy J. Gridley at Exeter, N. H. in 1828 in a sextodecimo volume of two hundred and sixty-four pages under the title "The Mill of the Muses." Of these poems many are patriotic and based on some historical incident such as the death of Washington, and the Battle of New Orleans. Others show a very melancholy mood and all have a religious tone.

Dr. Gridley's home was the center of the intellectual life of the village of Castleton. In 1817 Middlebury College gave him the honorary degree of Master of Arts, indicating that that institution considered him somewhat above the average physician, since it did not grant that degree to any other physician who was not the holder of a degree either in arts or medicine. In that year Dr. Gridley was president of the state medical society.

Dr. Gridley's connection and service to his medical academy was not to endure very long. He was considered eccentric, especially in religious matters, and beginning about 1820 his eccentricity increased. About 1821 a near neighbor and close friend was accidentally killed while engaged in a service for Dr. Gridley. Soon after he began to show mental aberrations. Added to this were sorrow from the death of four children, and domestic difficulties as a result of which in 1822 his wife divorced him and he agreed to leave Castleton permanently.

In 1820 he resigned as Professor of Theory and Practice of Medicine and took the minor professorship of medical jurisprudence, but because of ill health did not teach after 1821. In 1825 he resigned from the corporation of the medical school. In the winter of 1822–23 he removed to Exeter, New Hampshire, to make his home in the family of his brother. Here his mental disability increased into a paranoia. He did little, if any, practice in Exeter.

Dr. Selah Gridley died in Exeter, N. H. on February 17, 1826 at the age of nearly fifty-six years, and was buried there. His wife died in Castleton in 1854, aged eighty-five years. The meager vital statistics of Exeter do not record the cause of his death, nor does the notice in the current local newspaper, but it is of interest that in the same issue of the local newspaper is comment on the many deaths in that town in that month from influenza, and extracts from Boston papers say that the "influenza epidemic" of that winter was the most severe in the history of the colony or commonwealth.

Dr. Theodore Woodward (1788–1840). Dr. Theodore Woodward was born in Hanover, N. H., July 17, 1788. He is recorded as a student in the medical school at Hanover for the session of 1810, but did not continue to graduation. What was more important to his future career was that he was a nephew of that capable medical teacher, Dr. Nathan Smith, who in 1797 established the New Hampshire Medical Institution, later known as Dartmouth Medical College, and in 1813 established the Yale Medical Institution.

Theodore Woodward studied medicine with his uncle at Hanover and in this intimate relation gained knowledge of the problems connected with administration of a country medical school, since the institution at Hanover was the first country medical school in the United States. This opportunity of intimately knowing such a school was a factor in his later successful career in medical education.

In 1809, at the age of twenty-one years, he was in Castleton, Vermont, for a period. At that date Dr. Gridley was thirty-nine years old. In 1810 he attended the medical lectures at Dartmouth, and probably in the same year began practice at Castleton. He soon secured a good practice and about 1815 began to take students. Dr. Woodward had no degree in medicine until in 1821 both Harvard College and Middlebury College conferred on him the honorary degree of doctor of medicine.

These two physicians, in spite of being competitors, and notwithstanding the disparity of age, became close friends. Possibly this was due to the difference of their medical tastes. Dr. Woodward had a taste for surgery and obstetrics and it was in the line of surgery that he made his professional reputation in later years. On the other hand, Dr. Gridley's taste was for materia medica and the institutes of medicine. He cared little for surgery, so that the coming of the younger colleague was probably not unwelcome.

Dr. Woodward gave distinguished service both in the profession and in the medical school until his health failed and he was compelled to give up practice and teaching in 1838. His loss was so great to the medical school that it suspended during the years 1838 and 1839, but in 1840, under an affiliation with members of the faculty of the medical school founded in Albany, N. Y. in 1839, the school in Castleton was reopened and carried on until 1861.

It is a peculiar coincidence that Dr. Theodore Woodward, like Dr. Gridley, became insane. He died in the Vermont Insane Asylum at Brattleboro on October 10, 1840, at the age of fifty-two years.

Dr. John Le Conte Cazier (1790–?). In September, 1789, Matthias Cazier, of early American Huguenot descent and a graduate in arts at Princeton in 1785, became the first pastor of the church at Castleton. Here on July 11, 1790 was baptized his eldest son as John Le Conte Cazier.

There is no record of the early education of this son. Matthias Cazier left Castleton in 1792. In 1806 he located at Lebanon, Madison County, New York, where he was pastor until his death in 1827. During this time he also conducted a private school.

In 1812 John Le Conte Cazier of Lebanon entered the medical school at Fairfield, N. Y. in its first year of operation. He remained for two sessions but did not receive a medical degree.

Both Dr. Gridley and Dr. Woodward showed much interest in the Rutland County Grammar School of Castleton. Of it Dr. Gridley was a trustee from 1815 to 1826. Founded in 1787 and incorporated in 1805 it had a succession of preceptors. Sometime between 1813 and 1817 to this position came John Le Conte Cazier, returning to his native village to teach, probably teaching there during the years 1815 and 1816. In 1817 he was teaching in Burlington, Vt. and in 1816 the University of Vermont had conferred upon him the honorary degree of A.B., which indicates either that he had attended some college or that he had been well tutored by his father.

His teaching at Burlington was not under any official appointment of the University of Vermont, the medical school of which was not founded until 1822. It is probable that he was giving private lectures on Anatomy and Physiology.

Although he later practiced medicine and is referred to as "doctor" careful search has failed to yield any record of a medical degree.

John Le Conte Cazier is recorded as scholarly in Greek, Latin, and French. He was also interested in Natural Philosophy, and correspondence about 1835 shows that he was experimenting with magnets as possibly having therapeutic value. He certainly was a student of chemistry as indicated by his giving a course in that subject. He is also recorded as well grounded in both anatomy and physiology. In his early years he was a teacher, but in later years practiced medicine.

Dr. Cazier was quite the subordinate member of the three who signed this document, and he remained on the faculty during only one year. His influence on the medical school at Castleton was transitory, so that the chief interest in him in the present connection is in the clauses in the agreement which refer to his minor participation in the management of the school, although his teaching duties involved all the fundamental subjects as well as the very delicate duty of securing, in a country community, the cadavers for such of the students as wished to dissect, a matter entirely optional in nearly every medical school of the United States up to 1850.

Attempts to follow his career after he left Castleton in 1819 have yielded little result. The last definite record found of him is in 1837 at Eaton, a small village in Madison County, New York, where he probably was practicing medicine since manuscript letters addressed to him there with the title of "Doctor" have been found. There is no record of association with other medical schools. Collateral evidence indicates he died about 1850.

The Agreement for Establishment of the School

This document, the text of which follows, was found among various other manuscripts connected with Dr. Cazier, but there is no record of their source. That this is the original draft of the document is shown by several erasures, changes of words and interlineations. The abbreviations, capitalization, and spelling of the original are exactly followed in the printing here. Underscoring of words in the document is indicated by the use of italics in the printing. It constitutes the earliest record at present known, of how a proprietary school came into existence in the early nineteenth century. It is written on two sides of a single foolscap ruled sheet. Authentic samples of the handwriting of each of the three parties concerned shows that no one of the three wrote it. Its phraseology indicates it was written by an attorney. It seems probable that the local attorney, known to have been a friend of all three of the men, drafted this agreement. That attorney was Rollin C. Mallory, later a member of Congress.

Articles of agreement between Selah Gridley, Theodore Woodward, and John L. C. Cazier for the purpose of establishing a medical school in the village of Castleton:—

Made Castleton February 1818.

1. Sd. school to be known by the name of THE CASTLETON MEDICAL ACADEMY.

2. A building, near the Rutland Co. Grammar School is purchased and to be prepared for the reception of students, books, suitable furniture, and other purposes appertaining to this institution, without delay, at the mutual and equal expense of sd. S. Gridley and T. Woodward.

3. The requisite Chemical furniture and tests, and preparations for Anatomical demonstration and requisite common furniture, candles, firewood and other necessary contingent expenses to be furnished equally by the sd. S. Gridley and T. Woodward.

4. The present medical Books of sd. Gridley, Woodward, and Cazier and other collateral Books which each one may deem expedient to present to be collected at the opening of the school and used as a common Library under the appropriate regulations to be found in this agreement, and the Constitution of Laws of the Academy connected therewith;—Provided, that the Books of each Proprietor distinguished by suitable marks, shall still be considered as his distinct property, and each one will consider it his duty to make due satisfaction for all injuries done in this department by himself; and Provided also, that the Books of each Proprietor shall thus continue in the use of sd. academy, as long as the services of the owner under this compact shall be rendered, or consideration for services according to this agreement shall continue to apply to him, and no longer; and Provided, also, that each Proprietor shall have the Privilege of reserving as many of his own books from time to time as he may deem necessary for his own use.

5. Sd. J. L. C. Cazier is not (to) be subject to any further expense respecting the premises.

6. The services of Lecturing during the appropriate term to be divided into four courses—thus—1 course on *Anatomy* and *Physiology* by sd. Cazier—1 course on *Chemistry* by sd. Cazier—1 course on *Materia Medica and Institutes and Practice of Medicine* by sd. Gridley—1 course on *Surgery* and *Obstetrics* by sd. Woodward.—

Each Lecturer will consider it his duty to conduct the course assigned him, and exhibit as far as practicable the most important parts of his subject with faithfulness and diligence.

7. The services of instruction during each of the reading terms, to be divided as nearly as may be, thus,—one half the instruction conducted by sd. Cazier (excepting the time of absence to be mentioned) and the remaining instruction divided equally between sd. Gridley and Woodward; Provided, that sd. Cazier shall have the privilege of being absent during a portion of the reading terms for four weeks or should he have occasion to leave town for eight or ten weeks, and receiving also his portion of compensation for sd. time of absence, in the same manner as if he shall have been in actual service; and Provided further that if in addition to the above period sd. Cazier shall have occasion, before the expiration of this contract, to remove his family from town or engage in Lectures at Burlington for another winter season—he may, by giving two weeks previous notice, withdraw his books, and his services and compensation from that time forward shall cease, unless renewed by special agreement.

8. No one of the sd. parties shall keep a private medical student, that is, instruct for his own *emolument* a student in any branch of medical science, in the town of Castleton, separate from the common jurisdiction, privileges and claims of sd. Academy, so long as he is connected with the same by his services or compensation.

9. Sd. Cazier shall have the privilege of making for himself, within the limits of this institution, any preparations in his own departments, the materials of which preparations shall be furnished at his own expense, provided that the

students shall have the privilege of viewing occasionally, and receiving liberal demonstration from the same.

10. The compensations or income of the Academy aforesd. to be thus distributed—viz.

The fees arising from all lectures during the appropriate term or connected therewith, to be divided in equal thirds between sd. parties—Gridley, Woodward and Cazier.

The fees or income for the Privileges of students in the reading terms to be appropriated thus—one half of sd. fees to sd. Cazier, and one half divided equally between sd. Gridley and Woodward.

The fines arising from injury or loss of Books, to be appropriated to the owner of the Book—and the fines or compensations arising from injury, waste or loss of any other Property, to be appropriated to the owner or owners of the article injured, wasted, or lost.

The drawing fees of the Library and fines for disorder, and other offenses not specified above, to be divided as the lecture fees.

Each Party is entitled to his due share of sd. income, until his connection with sd. Academy shall be regularly dissolved.

11. The division of all monies aforesaid, shall be made by the Treasurer, who shall be duly appointed, and who shall be a man of impartial character and standing, of adequate responsibility, and resident in or near the village of Castleton, which Treasurer shall be authorized and directed to distribute to each one of the aforesd. parties, S. Gridley, T. Woodward, and J. L. C. Cazier, according to this agreement, his just proportion and no more of all monies received by him the sd. Treasurer on account of the sd. Medical Academy.

12. Each one of the Parties aforesd. shall consider himself bound to act agreeable to the *Constitution and Laws* of the *sd. Medical Academy* herewith established, always giving due respect and accommodation to the character and services of the associate teachers, and no alteration in sd. Constitution and Laws or exception to their rules shall be made without the unanimous consent of every one of the aforesd. Proprietors.

13. The limits of this agreement are not to include more than one term of lectures, and to extend forward no farther than one year from the present date.

The exact date of this agreement is determined as in the early days of February because, accompanying this document, is found a printed broadside which is dated February 5, 1818 and probably was issued subsequent to the entering into the agreement by the three men concerned. It reads as follows:

CASTLETON MEDICAL
ACADEMY,

WILL be opened for the reception of students, on
Wednesday the 25th instant, when lectures will commence on the following subjects, viz.

ANATOMY, PHYSIOLOGY AND

Chemistry, two courses, by John L. C. Cazier.

SURGERY AND OBSTETRICS,

by Theodore Woodward.

INSTITUTES AND PRACTICE

of Medicine, and Materia Medica, by Selah Gridley.

SELAH GRIDLEY, PRES.

Castleton, Feb. 5, 1818.

Fay, Davison & Burt, Printers.

COMMENTS ON THE DOCUMENT

It should be noted that in the broadside announcement no degrees are added to any of these names. At this date Dr. Gridley had an honorary A.M. and Mr. Cazier an honorary A.B. These are probably omitted out of consideration for Dr. Woodward, who at this time had no degree. This is further evidence that no one of these men held a degree in medicine at this date.

Several things in this agreement merit comment. It is of interest to note that the first matter taken up after the name, is the establishment and control of a library. The division of library fees indicates that Mr. Cazier owned more books than either of the other two men.

The order of their names throughout indicates the relative responsibility of the three. Dr. Gridley, the senior, and president of the institution is first named and Mr. Cazier, the youngest in years and definitely the subordinate, is last named.

It is of especial interest that in Articles 4 and 12 the participants are designated as "proprietors." Thus in the agreement of the first entirely independent medical school in the United States is found historical justification for the name "proprietary school" which became the common appellation to this type of school in later years.

Another matter of interest is the reference to the "reading terms." The early development of the curriculum of this school was that in each calendar year there were three terms, each of fourteen weeks. One of these was a "lecture term," the other two were "reading terms." Thus there were forty-two weeks per year of instruction with a total of ten weeks vacation. The reading terms were optional and provided for instruction for those students who lacked competent preceptors. Such students were termed "resident students" and the printed student lists show a considerable group of these in each year throughout the history of this school.

The name of academy of medicine was a novelty. Why it was so called can only be conjectured, but all previous American organizations for instruction in medicine had been called either medical departments, medical colleges, or medical institutions. In 1822 the name was changed to Vermont Academy of Medicine, and in 1841 to Castleton Medical College.*

The Beginning of the School

The Castleton Medical Academy started instruction on February 25, 1818. It had no charter, but probably Dr. Gridley, who four months earlier had retired from his second term as President of the Vermont State Medical Society, chartered in 1813, already had assurances of the charter. He was personally acquainted with many members of the legislature, for it was the custom of the medical society to meet at the state capitol each year just after the legislature had convened. The records show the evening meetings of the medical society held in the legislative chambers. This indicates friendly relations between the legislature and the medical society, and Dr. Gridley was one of the two most influential men in the medical society.

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* In considering early American medical schools confusion arises from the fact that frequently appellations were used in place of the real name of the school. These appellations were usually place-names. A few instances may be cited. Before 1810 when the Harvard Medical School moved from Cambridge to Boston, that school is often called the Cambridge Medical School, and after 1810 the Boston Medical School. New Hampshire Medical Institution was often called the Hanover Medical School. The College of Physicians and Surgeons of the Western District of New York was so cumbersome a name that almost universally it was called the Fairfield Medical School and occasionally the Herkimer Medical School from the name of the county of its location. The Berkshire Medical Institution, Medical Department of Williams College, located at Pittsfield, Mass., is frequently called the Pittsfield Medical School. At Woodstock, Vt. was a school the name of which from 1830–1836 was the Clinical School of Medicine, and after that date Vermont Medical College, but it was usually called the Woodstock Medical College. The name Vermont Academy of Medicine was often confused with the Vermont Medical Society so that this school was usually called Castleton Medical College. Apparently in response to usage this was adopted as the official name in 1841.

The Vermont legislature granted the charter on October 29, 1818, during the meeting of the Society in Montpelier. Although this act gave the power "of instructing in the science of physic, surgery, chemistry, and all the different branches of science connected with the healing art," it failed to give any power to grant degrees. This seems to have been an oversight, according to the language of the amendment passed a year later. This amendment passed on October 27, 1819, gave full power to "the president of the Academy, with consent of the professors of said academy" "to give and confer those honors and degrees as are usually given in such medical institutions." Nevertheless, the arrangement concluded in August, 1819 by which Middlebury College conferred, under her charter, the medical degrees on the students at Castleton, continued until 1827. The degrees of medical graduates at Castleton thus were granted, as the catalogue states, "by the joint authority of Castleton Medical Academy and Middlebury College." A degree conferred by two corporations may well have been considered especially attractive.

It is known that the inititative for the organization of the Yale Medical Institution came from the state society. A careful reading of the entire records of the Vermont State Medical Society shows no similar action concerning the Castleton Medical Academy. That the society was friendly is shown by the election of two delegates of the society to participate in the examinations of candidates for the degree at the new medical school. This annual appointment was kept up throughout the life of the school. Similar delegates were appointed for the two other medical schools which appeared in the state in 1822 and 1830.

The organization of the school at Castleton was the beginning of a period of increase of medical schools in New England. In 1820 the Medical Department of Bowdoin College at Brunswick, Maine, was founded; in 1822 the Medical Department of the University of Vermont at Burlington; and in 1823 the Berkshire Medical Institution at Pittsfield, Massachusetts, so that by 1824 there were eight medical schools in New England—just one-half of the sixteen medical schools in the United States. In 1827 was the beginning of the Clinical School of Medicine at Woodstock, Vermont, which after some faltering became "connected with" Waterville College (now Colby) at Waterville, Maine, an institution two hundred and fifty miles distant and in another state.

LATER HISTORY

This school, born, as we have seen, in a country village with two able men as godfathers, had a thoroughly honorable career. It gave good instruction and was moderate in granting honorary degrees. If all the independent schools had done as well the history of nineteenth century medical education would have been quite different.

With the outbreak of the Civil War and with the competition of the refounded medical department of the University of Vermont, the medical school at Castleton finally closed at the end of the session of 1861. It had had over forty years of teaching in which it graduated 1569 men who, not only in Vermont and adjacent states, but also in the middle and far west had important influence in medical practice and advance of the nineteenth century. A considerable number of the men occupied teaching positions in medical colleges.

Of all the independent small town medical schools, the oldest two, those at Fairfield and Castleton, had the most honorable careers. Fairfield continued twenty-eight years and Castleton had a life span of forty-three years. It, therefore, has seemed worth while to bring to attention of present day physicians the conditions of origin in one of the pioneers of this type of medical school peculiar to American medical education.

CLAUDE BERNARD AS A DRAMATIST*

By J. M. D. OLMSTED, PH.D.

BERKELEY, CALIF.

JUST one hundred years ago a provincial youth, barely twenty-one, armed with the manuscript of a tragedy in five acts, set out from the small French village where he was born to storm the literary heights of the great capital, Paris. Before the end of his life he did attain the highest honors his country could bestow, but in a field so far removed from the drama that the story of his youthful excursion into literature clung to him and cropped up every now and then as one of those anecdotes which are humorous to others, but rather irritating to the person about whom they are told. The young dramatist was Claude Bernard who became the greatest physiologist of the nineteenth century.

The future Professor of Medicine at the Collège de France, member of the French Academy, honorary fellow of the Royal Society of London, etc., received all his early schooling from parish priests and Jesuit fathers. Family reverses forced him to leave school in his teens and earn his board and lodging as pharmacist's apprentice in a suburb of Lyons. He was not destined to hold this position long, for we find the worthy proprietor writing to Bernard's parents in Saint-Julien to send for their son. He complained that the boy had lost interest in rolling pills and compounding drugs, and spent too much of his time dreaming. The apprentice had been allowed one night off a month, and it seems that he spent these precious free hours at the theatre. What he had heard and seen there had inspired him to try his own hand, and he had written a "vaudeville" which was actually put on with success at the theatre des Célestins during the year 1833. This success and the hundred francs it brought seemed to him to seal his fate; destiny had intended him to be not a pharmacist but a playwright. He now began a serious work, a tragedy in five acts. This was too much for his employer, and Bernard returned home. A year of enforced idleness during which he finished his play made him long for recognition such as could be found only in Paris. A lady in Villeneuve, where he had attended the Jesuit college, gave him a letter to M. Vatout, at that time friend and librarian to the Bourgeois king, Louis Philippe, and in November, 1834, Bernard took the diligence for the capital.

M. Vatout received the young provincial with kindness, and procured for him an introduction to M. Saint-Marc Girardin, Professor of Literature at the Sorbonne, then at the height of his fame as a critic. M. Girardin read the manuscript, then said firmly, "Vous avez fait de la pharmacie, faites de la médecine. Vous n'avez pas le tempérament dramatique." The blow was severe, but the advice was taken. Bernard entered the medical school and became the glory of French science. One is reminded of that other Frenchman, born about the time that this incident took place, Victorien Sardou, whose case was just the reverse of Bernard's, for Sardou began his career with the idea of being a doctor and ended by being a dramatist. Did one of Sardou's instructors in dissection at the old Necker Hospital perhaps say to him, "You have not the temperament of a physician; try writing plays!"?

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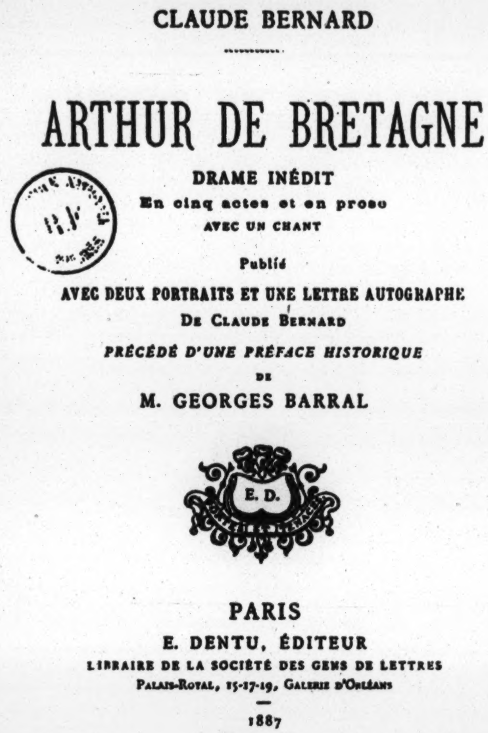
* Read before the California Medical History Seminar, April 14, 1934.


CLAUDE BERNARD

ARTHUR DE BRETAGNE

DRAME INÉDIT
En cinq actes et en prose
AVEC UN CHANT

Publié
AVEC DEUX PORTRAITS ET UNE LETTRE AUTOGRAPHE
DE CLAUDE BERNARD
PRÉCÉDÉ D'UNE PRÉFACE HISTORIQUE
DE
M. GEORGES BARRAL

E. D.

PARIS
E. DENTU, ÉDITEUR
LIBRAIRE DE LA SOCIÉTÉ DES GENS DE LETTRES
PALAIS-ROYAL, 15-17-19, GALERIE D'ORLÉANS
—
1887

FIG. 1.

Yet the story of the rejected manuscript clung to Bernard. Forty-four years later, almost at the moment that the Chamber of Deputies was voting on a law, till then unexampled in the history of France, to give a great scientist a public funeral at the nation's expense, the newspaper, *le Figaro*, was informing its readers:

> Claude Bernard entered Paris empty of purse, but with a manuscript, a tragedy in verse about Charles VI, composed while compounding medicines. It was detestable. M. Saint-Marc Girardin told the young man that literature was not his forte, that he had better turn his attention elsewhere. Claude Bernard obeyed and thought no more of Charles VI. One of his friends, a doctor who went mad, had the courage and innocence to learn the famous tragedy by heart. He carried it with him to the grave. There is no other copy.

We shall see as we proceed how inaccurate was the journalist's account of the incident.

It is true that Bernard himself would never have this early effort published—he referred to it as "this tragedy with which I am reproached"—but shortly before his death he presented the yellowed sheets to the son of an old friend, M. Georges Barral, with the express stipulation that if M. Barral wished to publish it he might, but not until at least five years after the author's death, and that it must bear the statement that it had been read and refused after numerous corrections by M. Saint-Marc Girardin in 1834. M. Barral waited nine years before publishing the drama, and kept the original manuscript in an iron coffer like a precious relic. Because a certain paragraph in his preface offended the surviving members of Bernard's family—he had referred to the fact that Mme. Bernard and her two daughters had left the scientist when he was old and ill—it was withdrawn from circulation. The book is now a rarity, indeed a collector's piece. Copies are to be found, however, in certain of the great European libraries, for instance, in the Bibliothèque Nationale at Paris, and in the Bibliothèque Royale at Brussels, but not in the British Museum.

The play turns out to be a typical romantic drama characteristic of the period, somewhat immature, somewhat pedestrian, but by no means an unworthy effort. Its title is "Arthur de Bretagne," and it deals with the struggle of young Arthur in 1202 against his wicked uncle, King John, who had not only usurped from him the throne of England, but was planning to deprive him of his French provinces as well. The play opens in Brittany at the manor-house of des Roches, for whose young daughter, Marie, the boy Arthur has conceived a deep attachment. Des Roches urges Arthur to fight for his rights, and the lords of the provinces also urge him to defend them. He promises, but the fighting goes against him. King John proposes peace, but a dishonorable peace, since he demands that Arthur renounce his claims both to the English throne and to the French provinces. Arthur refuses; he has pledged his word and will not go back on his oath. He is captured and imprisoned. At John's orders the governor of the prison prepares to burn Arthur's eyes out with red-hot irons, but desists at the victim's pleadings. Des Roches plans for Arthur's escape; the bars of the tower window have been sawn through; Arthur is to lower himself by a rope when he hears the hymn to the Virgin. The song is sung, Arthur disappears through the window and Marie (who as a result of Bernard's ingenious dramatic construction has penetrated to her lover's prison) is left behind in the dungeon tower. Suddenly her father, covered with blood, together with the Dauphin of France and a crowd of soldiers, bursts into the room. Treachery! John has learned of the plot through his spies. Des Roches gasps out that he saw John take his nephew away in a boat, saw him plunge his dagger into the boy's heart, heard Arthur's last cry. Faithful old des Roches falls dead at his daughter's feet, and Marie with a cry, "Oh la mort! à moi aussi la mort!" falls in a faint as the curtain is rung down on the fifth act.

The years 1833-34 in which Claude Bernard was writing his play came in the midst of the upward swing of the romantic movement. Classic tragedy in its old age had become set, inelastic; in fact, Bernard might later have described it as having been in an advanced state of arteriosclerosis and its demise imminent. The theatre needed rebirth and Victor Hugo took upon himself the task of fathering the new movement. In the preface to his "Oliver Cromwell," written in 1827, he announced the principles which were to guide the new school of romantic drama. Away with the old unities! Away with all rules! Give the audience a glimpse of real life. Introduce historical characters in authentic settings. Refer to actual historical events.

Just about this time Shakespeare was discovered by the French. English companies were giving performances on the Parisian stage with phenomenal success. French authors began to borrow freely from Shakespeare. In fact, de Vigny's "Le Môre de Venice" is merely a transcript of "Othello," and Delavigne's "Les Enfants d'Édouard," produced the very year that Bernard was writing "Arthur de Bretagne," owes much to "Richard II." It is no matter for astonishment that the young Bernard took as his theme the story that Shakespeare had already used in "King John." Latourneur's translation of Shakespeare was available to Bernard, as there was a complete set in the public library of Lyons at this time.

That Bernard was familiar with "King John" is suggested by several pieces of internal evidence in his own play, the most striking of which is the blinding scene. In Shakespeare's play, when the jailor, Hubert, prepares to put out Arthur's eyes with red-hot irons, Arthur pleads with him, and in the end Hubert relents. The "pretty child" shall "sleep doubtless and serene." But there are spies about; therefore John shall be informed that his nephew is dead. Hubert later confesses to John that he has not harmed Arthur. Bernard in his scene has Guillaume de Brausse, the governor of the prison, come to interview Arthur. The substitution of Guillaume for Hubert is historically accurate. Guillaume, like Hubert, has been an old family retainer and he and Arthur talk together of the old days. John has ordered that Arthur's "eyes are to be burned out with a red-hot iron." In response to Arthur's pleadings Guillaume relents. "These orders are frightful. I will not give them. Now there is no lack of spies; they will see that you have your two eyes and will denounce me to King John. Mount the stair and await me in the small room." No sooner is Arthur hid than John enters and asks for the prisoner. Guillaume replies, "Arthur is dead!" John storms, "You shall be hanged! I ordered you to threaten him, not to kill or mutilate him!" "Heaven be praised, he still lives!" says Guillaume. In none of the narrative histories available to Bernard at this time, which I have been able to consult, has there been mention of an attempt to put out Arthur's eyes. We must assume, therefore, that Bernard borrowed this incident from Shakespeare.

Bernard seems also to have taken from Shakespeare the idea that the provinces should choose for themselves between Arthur and John, for the French histories of 1830 do not mention such a proposal (v. King John II, I.: Arth. de Bret. III, 7; IV, 7.).

It is also perhaps more than a coincidence that Marie in Bernard's play says to Arthur, "In the provinces as in Brittany the women devote themselves to your cause." This reference to the part played by women in a campaign sounds like a reminiscence of Shakespeare's more elaborate rendering of the same idea:

For your own ladies and pale-visaged maids
Like Amazons come tripping after drums,
Their thimbles into armed gauntlets change,
Their needles to lances, and their gentle hearts
To fierce and bloody inclination.

One may conclude that Bernard followed the literary fashion of his day in making use of Shakespeare as a source, but it is important also to notice his independence in adapting the material to his own conception of the story. The titles of the two plays correctly indicate where lies the chief interest in each: in Shakespeare it is the uncle, and Arthur is only a pawn to be moved about and lost long before death takes King John; in Bernard the interest centers in the nephew—John is only the wicked cause of all Arthur's troubles and the play ends naturally with Arthur's murder. In Shakespeare Arthur is a mere child. Pembroke speaks of

. . . the inheritance of this poor child,
His little kingdom of a forced grave.
That blood which owed the breadth of all this
  isle,
Three foot of it doth hold.

Bernard's Arthur, on the contrary, is a youth in his teens, inexperienced, but no longer a child—"so young, and already understanding so well his rights and his duties," "a prince worthy to command." In this Bernard is accurate. Arthur was sixteen at the time of his death. In Shakespeare, Arthur's mother, Constance, and his notorious grandmother, Eleanor, play very important rôles; neither one appears in Bernard's play. In Shakespeare there is only a very meagre love story and it concerns the Dauphin of France and Blanche of Castille. In Bernard the love story of Arthur and Marie is all important to the plot and runs all through the play. Bernard has portrayed King John as the basest of mortals, the worst king imaginable, capable of the whole gamut of wickedness from lechery to murder, and he follows the French tradition in having John kill Arthur with his own hand. Shakespeare's John is, of course, a more ambitious piece of characterization, no mere assassin. He gives orders that Arthur shall be made away with, but does not propose to do the deed himself. In fact, Arthur's death in Shakespeare comes about in a way which does not involve John directly. Arthur appears on a high wall disguised as a ship's boy. He is afraid of the height, yet leaps from the wall, and as he dies from his injuries he exclaims:

> O me! my uncle's spirit is in these stones:
> Heaven take my soul, and England keep my
> bones!

Indebtedness to Shakespeare is, however, only one aspect of Bernard's acquiescence in the habits of his contemporaries. His adherence to the rules of supposedly ruleless romantic drama is strict. He has followed scrupulously the narrative of the historical events related to Arthur's career as they are recorded in the histories of his day. It has already been mentioned that he corrects Shakespeare with regard to Arthur's age and the name of his jailor. He is careful to give us the exact date, 1202; he names aright the English provinces on the continent whose allegiance was in dispute, namely, Anjou, Poitou, Maine, and Touraine; he is correct in having Arthur attack Poitiers, and in having the comte de la Marche fight on Arthur's side; he also lets the audience know that he is aware that Arthur's grandmother, Eleanor, was in the besieged town; he describes the relations of both John and Philip to Arthur with historical accuracy; among the crimes of John are mentioned the trouble he made for Richard when the latter was away on the crusades, and, above all, his affair with Isabelle, wife of the comte de la Marche; finally, he has Arthur die in the manner accepted by tradition. He also follows the rule that the author should bring into the dialogue bits which have the savor of historical documents. Des Roches has a long speech on the political situation of 1202 which reads like a paraphrase of pages 97 seqq. of volume IV of Augustin Thierry's "Histoire de la Conquête de l'Angleterre."

In one very important particular Bernard deviates from the historical accounts; he represents Arthur as in love with Marie, daughter of des Roches, who is of good, but not of royal blood. The plot hinges on the unsuitability of such an alliance. Thierry, like other historians of the time, states clearly that when Philip armed Arthur with two hundred men and sent him against Poitiers, he promised him in marriage his small daughter, Marie, then five years of age. Bernard, to show us that he knew perfectly well what he was doing in making Marie the daughter of des Roches, has the Dauphin say to Arthur, "I have a sister of your age; you know the noble child; she is not without esteem for the duc de Bretagne. Arthur, remain today our friend, tomorrow, perhaps, you will be my brother." It is evident that Bernard deliberately took liberties with the situation in order to introduce a proper love story. It is interesting that he should have retained the name, Marie, for his heroine, and also that he should have changed the age of Louis' sister to one more suitable for a damsel contemplating matrimony.

It is curious in view of what seems to be the obvious influence of the literary tendencies of the eighteen-thirties on Bernard's play to find that towards the end of his life the great physiologist complained, "Nevertheless my tragedy was classic. It was composed of five acts in which I observed the rules laid down by Aristotle for unity (of action), of time and of place, and I fell into the midst of romanticism which did not respect any sort of unity." Whatever may have been Bernard's intentions with regard to structure, a casual reading of some of the French romantic dramas of this period is as useful a commentary upon his style as is a consideration of "King John" upon his choice of incident.

This is particularly true of Victor Hugo's famous "Hernani," famous because at its first performance classicists and romanticists were so violently aroused against each other that they indulged in a battle royal in the theatre. Victor Hugo's play is, however, in verse, Bernard's in prose. In "Hernani" we have all the trappings of melodrama, the punctilious regard for historical detail and the extravagance of language which are characteristic of the period. The opening scene is typical. Don Carlos, afterwards Charles v, cap over eyes, mantle under nose, "in the rich costume of 1519"—mark, nothing so indefinite as "early xvith century"—makes his way through a window into a lady's chamber. He seizes Dona Josepha's arm and hisses, "Two words more, duenna, and you are a dead woman!" The play is full of duels, alarms, shoutings, and sounds of fighting. Daggers appear at every turn. There are ancestral portraits, one of which comes away from the wall to disclose a secret hiding place. At the end the hero and heroine both take poison and die slowly. The heroine's late fiancé, incidentally her aged uncle, when he sees the lady dead exclaims, "Morte! Oh! je suis damné!" Then he kills himself as the curtain slowly falls. One wonders that the spectators can refrain from joining in the cry with Gomez, "Oh! je suis damné!"

"Arthur de Bretagne" never, perhaps, quite achieves the fine frenzy of extravagance exemplified in "Hernani," but, making allowances for Bernard's lack of "temperament," one may say that it has its moments. There are no portraits, and we miss the poison; but we have excursions and alarms, daggers and disguises, and the final curtain goes down on a stage strewn with prostrate bodies.

In Act ii of "Hernani" we see at once the source of Bernard's idea for his big scene between Marie and King John. In "Hernani" the king, Don Carlos, tempts Dona Sol, who although affianced to her uncle, an elderly gentleman past sixty, is in love with Hernani, the bandit. Don Carlos tells of his position in the world. He will make Dona Sol a duchess if she will consent to his wishes. Dona Sol recoils, "There can be nothing between us, Don Carlos. I am a noble daughter of jealous blood—too much for a concubine, too little for a wife." Don Carlos will make her a princess. "No!" He will even go the length of offering her his name and throne. Dona Sol still refuses. She snatches the dagger from his belt. "Come one step nearer and I will kill you and kill myself." She calls loudly, "Hernani!" "Hold your tongue," hisses Don Carlos.

In the third act of Bernard's "Arthur de Bretagne" a table has been prepared for two in a room in the fortress at Poitiers. The gentle Marie enters the presence of King John begging mercy—she hesitates to say for Arthur—"for the companions of my father." John says that he will hear her after he has had a drink; he has had a hard day's fighting and wants relaxation. He leads Marie to the table but she refuses to partake. The stage directions thereupon inform us that John eats and drinks enough for two. He finds Marie both young and beautiful; youth and beauty should not be buried in the country. The passages that follow can only be described as the purple patches of the drama. John outlines the pleasures of the court, the chief of which would appear to be the licence to lie abed in the morning (doubtless in contrast to the hours of an apothecary's apprentice). "The sun is already high in the sky when softly extended on your couch you are still cradled in sweetest dreams." In her awakening languor the lady will be like "a dewy flower drooping under the kisses of the dawn." Then breakfast is brought up, "un vin genéreux, le gateau de pur froment, la bisque friande, la dragée parfumée." The rest of the day passes in the pleasures of the chase, the intoxication of the tournament, in feasting and dalliance, until the evening stars shed their discreet radiance down upon the silence "de l'amour et de la nuit!" Marie replies chastely, "Pure pleasures are the only true pleasures." John proceeds to the advantages of riches. Marie replies that she would be afraid of too many riches. "What charity one must have to be adequate to riches!" John tries her out on position, on rank; but Marie says piously, "God alone should be adored." Exasperated, John attempts to embrace her, but Marie eludes him, and he takes refuge in rather sheepish apologies, "I have offended you. Don't be inflexible. The fatigues of the day, this repast eaten so hastily, and above all, your beauty!" Bernard was evidently not unaware, even at this early age, of the reputed physiological effects of alcohol and the action of internal secretions, a term which later he was the first to employ.

M. Barral in his preface to "Arthur de Bretagne" justifies his publication of the play on the ground that in it are revealed "the future qualities of the great investigator." He leaves the reader to ferret out such revelations for himself, however, without even a hint as to the passages where they may be found. It is true that certain aspects of the play seem to be rather personal to the youthful Bernard of the time when it was written. The hero, Arthur, if not a self-portrait, is at least an expression of boyish idealism. The emphasis laid upon

Arthur's high sense of duty and his freedom from personal ambition is consistent with the character of Claude Bernard as it developed in later life. Bernard's ambition was never merely personal. This is proved by his devotion to an unremunerative and purely scientific career as opposed to an exploitation of his great skill in a lucrative medical practice. His high sense of duty appears in his assumption of his father's debts at the latter's death and the herculean efforts to discharge them that occupied most of the rest of his life. There is no evidence that Bernard in later life had any active interest in religion; certainly he was not in sympathy with what has been called the bigotry of his wife and daughters, but the frequent references to religious devotion in the play seem to be derived very directly from the instruction which Bernard would naturally have received from parish priests and Jesuit fathers. The little song to the Virgin, his one lapse into verse, might be an echo of the days when he was "enfant de chôeur" in the little village of Saint-Julien. The occasional naïveties in the love story of the play may be put down either to the youthfulness of the hero and heroine or to that of the author. Bernard's romanticism is not only less robust than that of Victor Hugo, but it is well anchored in bourgeois conventionalism. Arthur's most passionate speech is an aside: "Angel of purity! Oh! let us not inject into her soul the fire which burns and consumes my own." Later he explains to his prospective father-in-law that "there comes a time when a man is no longer content to be loved or to love only with a sterile love. He must have more masculine (Fr. mâle) affections, beings to protect. . . . The lover gives place to the father of a family." There is assuredly nothing of "flaming youth" in the love story of "Arthur de Bretagne"; on the contrary, there is a saving touch of delicacy and sensibility which it is fair to regard as the personal contribution of Bernard.

But where are the evidences of the future qualities of a great investigator? Given the rules and provided with models, Bernard followed instructions to the letter and turned out an honest piece of work. His is a good workman's performance, nothing skimped, no shoddy materials, no loose ends; a thorough, if an uninspired job. The future investigator may perhaps be seen in the thoroughness with which he accomplished his self-set task. There is, however, another characteristic of the play which was later to stand Bernard in good stead. He attempted little so-called fine writing; with the exception of the little canticle, he wrote in prose, and it was clear and straight-forward prose. The purple patches were isolated in the late supper scene. Thirty-four years later, on his reception into the French Academy, it was his style, as exhibited in his scientific works, which impressed the academicians so strongly. It was praised for its perfect simplicity, its freedom from exclamatory or interrogative movement, its sparing use of periods, its unforced quality. "Arthur de Bretagne" is adorned with these natural graces, but neither they nor Bernard's admirable industry have made it more than a literary curiosity, the unsuccessful attempt to find himself of a youth who was to become famous in another field.

A SHORT HISTORY OF IRON THERAPY

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IRON has been known to man since prehistoric time. It was the custom of many ancient peoples to attribute the discovery of iron to some god or deity, hence information concerning the earliest use of iron is lost amongst the myths and folklore of the ancients. The Egyptians ascribed the discovery of iron to Osiris, the Greeks to Kadmos or Prometheus, the early Germanic tribes credited Odin with the discovery, and the Romans attributed it to Vulcan. The writings of Homer and Hesiod contain allusions to iron, as do the Vedas, the Bible and many other ancient works. In the old annals of China, claim is made that iron was discovered in that country at a time which has been calculated to be about 2900 B.C. Actual proof that iron was known and used in Egypt at the time of the early kings of the Fourth Dynasty (about 3000 B.C.) has been adduced from inscriptions and sculptures dating from that period. The Egyptian term for iron, "*baaenepe*" or metal of heaven, clearly implies a belief in divine properties possessed by the metal. A similar idea is found in Greek myths in which iron is said to be imbued with divine power by Mars, giving it special value in the cure of injuries received in war. This is perhaps the earliest allusion to the use of iron according to the doctrine that "similis similibus curantur." So intimately was the name of Mars connected with iron that until very recent times iron was spoken of in the pharmacopeias as mars, and we find such terms as crocus martis or saffron of mars in common use even during the latter part of the nineteenth century.

The earliest direct reference to iron as a curative agent is found in the writings of Apollodorus, dating from about 2000 B.C. According to this author, Iphyclus, one of the Argonauts, was cured of impotence by a certain Melampus of Argos, who prescribed rust which had been scraped from an enchanted sword and dissolved in wine. Following this miraculous cure, the fame of Melampus spread far and wide, and because of his talents he is credited with having been the first mortal that possessed prophetic power as well as having been the first mortal to practice medicine. Before that time both those privileges had been reserved for the gods. Later, according to the story, Melampus became physician to Pretus, king of Argos, and cured Pretus' daughters of lycanthropy. It is not stated whether or not he used iron in this cure. He is said to have spoken of iron as a medicine that gives strength to the system.

It is a familiar fact that the ancient Egyptian pharmacopeias described drugs principally of organic origin. Iron was one of the few inorganic medicines recognized by the early Egyptians. In the Ebers Papyrus which dates from about 1600 B.C. mention is made of the use of iron as a drug. Iron sulphate seems to have been the form employed, but there is some obscurity as to its uses. We have no definite information as to whether or not the Assyrians and Babylonians employed iron therapeutically. In many respects the Babylonian pharmacopeias were similar to the Egyptian, so that it is not likely that iron was used medicinally by the peoples of Asia Minor.

An hiatus of about 1100 years occurs between the time of the Ebers Papyrus and the time of Hippocrates. There is no record of any contribution to the literature on iron therapy during this period.

Starting with Hippocrates, however, there is an uninterrupted series of references to iron, practically every prominent figure in medical history contributing something to the literature. It would be beyond the scope of this paper to attempt a complete review of the ancient and medieval writings on iron. A few of the more significant contributions and contributors have been selected and will receive brief mention.

Hippocrates himself frequently mentions iron in his writings. He states that: "It is impossible for water which comes from earth where there is iron to be good. It must of necessity be hard and heating, difficult to pass by the urine, checking defecation." He prescribes iron in cases "where the bowels are soft and lax, with tendency to phlegm," but strangely enough also recommends iron as a cathartic.

During the first century of the Christian Era iron seems to have enjoyed great popularity as a therapeutic agent, for we find many writers recommending iron for a great variety of uses. The elder Pliny, for example, states that iron rust is a valuable medicine, and recommends it as a protection against sorcery and ghosts as well as against sudden pains in the side or chest. The famous Theriacum Andromachi, concocted by Nero's body physician to protect the emperor from poisons, contained among its 64 ingredients some form of iron, probably the peroxide. Celsus in his "De Medicina" speaks of iron as a useful medicine. Scribonius Largus, the compiler of one of the earliest known formularies, described the preparation of iron water by heating iron until it was red and then immersing it in water. He used this water in the treatment of splenic diseases of children.

Perhaps the earliest materia medica of which we have any record is that of Dioskorides Pedacius, a Greek who flourished about 60 A.D. It is interesting that Dioskorides was a botanist, and that some of the names which he gave to plants are in use to the present day. The materia medica of Dioskorides was considered the highest authority on the subject for some sixteen centuries. It is not surprising that a botanist should describe drugs principally of plant origin, nevertheless he mentions iron rust as being a valuable remedy for a number of different disorders, including those of the spleen.

Galen is known to have used iron in his practice, for he specifically mentions employing the sulphate of iron for its astringent effect. Aëtius (*circa* 500 A.D.) in his "Tetrabiblon" speaks of iron as a remedy for splenic engorgement.

From the writings of the Arabian physicians during the dark ages we know that iron was used medicinally during that period. Rhazes, for example, prescribed iron to strengthen the sexual powers. We cannot help wondering whether Rhazes was familiar with the old legend of Melampus and Iphyclus. Among the other prominent Arabian doctors who prescribed iron may be mentioned Albucasis, Avicenna and Serapion.

An excellent review of the early literature on iron therapy is given by Nicolas Monardes of Seville in his "Dialogue of Iron and the Virtues Thereof." This scholarly work was written about 1571, was translated into English and ran into several editions. The author displays a striking command of his subject, and reviews the opinions of most of the physicians so far mentioned in the present paper, as well as those of many others. In concluding he states his own views on the medicinal value of iron.

Up until the fifteenth century there had appeared a number of formularies and works on Materia Medica. The earliest pharmacopeias of the renaissance did not appear, however, until about the middle of the sixteenth century. As might be expected, various forms of iron are described in all of these early pharmacopeias.

Early in the seventeenth century there appeared a treatise on mineral waters written by a German named Hoffman. The author speaks of the beneficial as well as the deleterious effects of various waters. Of steel waters he says: "When drunk, they loosen the belly, but strengthen the body and stomach, and provoke the appetite."

Sydenham, the outstanding clinician of the seventeenth century, frequently mentions iron in his writings, and seems to have held the metal in high esteem for its therapeutic value. He states that " . . . as iron may be given in the largest doses without the inconvenience which attends most medicines when exhibited largely . . . it is the most important remedy in diseases in which tonics are exhibited." Evidently none of Sydenham's patients experienced any "loosening of the belly" of a distressing degree. Sydenham's powers of observation are illustrated by the fact that he noted that oxide of iron, when long used, increased the redness of the cheeks and of the lips. Thus without the aid of counting chamber or hemoglobinometer he was able to follow the improvement of the blood under iron therapy. In addition to the use of iron as a tonic, Sydenham recommended its use in hysteria and as an anthelmintic. He treated cases of incipient dropsy with iron and garlic. His favorite iron compound was an infusion of iron or steel filings in Rhine wine, which he considered a "very elegant preparation." Curiously enough this infusion was practically the same as that used by Melampus some 3600 years previously. In the treatment of chlorosis Sydenham recommended some remedy drawn from mars to fortify the blood, and considered native iron preferably since he thought that refining might result in some loss of efficacy.

Among the foremost medical men of the latter part of the seventeenth century whose writings contain reference to iron may be mentioned Thomas Willis, who expressed the belief that iron could impart its color to the blood, and Boerhaave who in his "Aphorisms" recommends infusions of steel in wine for the treatment of chlorosis.

About 1720 Pierre Pomet, chief druggist in the court of Louis XIV, published his famous "Histoire Générale des Drogues." This work was translated into English a few years after it appeared, and enjoyed wide circulation. Concerning iron Pomet says the following: "Saffron of mars (Crocus Martis) is an excellent remedy for dropsy, and to cure the green sickness." He recommended a dose of from 10 to 40 grams, and believed that the most efficacious form of this drug was made by exposing plates of iron to dew, or sprinkling them with rainwater. Pomet also states that "iron made red hot in the fire and several times quenched in water renders the water proper for diseases of the belly," and that the water of the smith's forge is especially good. He further writes that "filings of steel are proper to remove obstructions, for the jaundice and for the diseases of the spleen. The dose is from a scruple to a dram."

In a "Treatise of the Fossil, Vegetable and Animal Substances that are made use of in Physick," written by Etienne Francois Geoffroy, about 1715, and translated into English by G. Douglas, the author attributes the efficacy of iron to the fact that it enters into the blood, by which it is "diffused through the whole habit, its astringent virtue being everywhere exerted." Whether or not Geoffroy actually demonstrated the presence of iron in the blood we do not know. Most writers state that this most important discovery was made by Menghinis in 1746. According to Christian, however, Lemery and Geoffroy demonstrated the presence of iron in the ash of blood as early as 1713, and Menghinis was responsible for bringing this discovery to the attention of the medical world. In any event, Menghinis deserves a large measure of credit, not only for focussing attention on the presence of iron in blood, but also for his experimental work, by which he demonstrated that the iron in the blood could be increased by feeding animals on iron-containing foods. This work was confirmed by Rouelle and Bacquet in 1747, by von Forcke in 1779, by Lichtenstein in 1899, and more recently by Hooper and Whipple.

The writings of Pomet have been quoted and may serve to illustrate the position occupied by iron in therapeutics in eighteenth century France. No better authority than William Cullen, a contemporary of Pomet, could be quoted to express the views of British physicians of that period concerning the medicinal value of iron. Cullen considered iron a valuable tonic, and thought that the saline preparations were most efficacious, although he sometimes prescribed iron filings. It is of particular interest, in the light of recent studies, that Cullen stated that the good effects of iron have often been missed by giving it in too small doses. In colonial America, Benjamin Rush was a leading exponent of iron therapy. In his "Inquiries" he tells of curing an incipient ascites and anasarca by large doses of the rubigo ferri, and also of using steel filings and rust as an anthelmintic. In these uses of iron, Rush seems to have followed the teachings of Sydenham.

The early American literature on the subject of iron therapy received an extremely valuable contribution in 1805, when James C. Madison of Virginia published his doctor's thesis entitled: "Observations on the Medical Properties of Iron." In this scholarly work Madison gives a rather cursory review of the historical background of iron therapy and presents the current views in regard to the uses of iron in medicine. Among other things he tells us that "the physicians of this country are much in the habit of using the limatura ferri (filings) as well as the rust," and that "iron rust has been given in the amounts of one ounce in twenty four hours," although the usual dose is one dram. He mentions no ill effects from the use of the very large doses.

In Europe, on the continent as well as in the British Isles, the popularity which iron enjoyed during the eighteenth century persisted through the nineteenth. A few representative writers may be cited by way of illustration. In Germany, Johann Gottfried Rademacher (1772–1850) was considered one of the leading authorities on materia medica. In his "Arzneimittel" he speaks of iron as being one of the most useful of drugs, and enthusiastically recommends its use in one form or another in most acute illnesses and many chronic ones. Rademacher lists five forms in which iron may be prescribed: the red oxide, the carbonate, tincture of ferric chloride, iron sulphate, and tincture of iron acetate. A contemporary of Rademacher was P. Blaud whose immortal pill was introduced to the medical profession in a treatise "Sur les Maladies Chlorotique, et sur un mode de Traitement Spécifique dans ces Affections." This article appeared in the *Revue de Médicine Française et Étrangère* in 1832. In Great Britain, Henry N. Draper of Dublin may be quoted as exemplifying British sentiment toward iron. In his "Manual of the Medicinal Preparations of Iron," which appeared in 1864, Draper lists some sixty-six forms in which iron may be prescribed. Speaking of the metal he says: "of repute in the treatment of certain diseased conditions from almost the earliest period from which history hands us down any record of medicine, it has continued to acquire popularity, until in our own time we find it holding among therapeutic agents a position not second to that of any other substance." Such eulogies of iron are common in the nineteenth century medical literature. A slightly more cautious note is sounded by Charles Phillips of Edinburgh, a leading authority on therapeutics and materia medica of the latter part of the nineteenth century. "Iron was at one time considered a panacea for all forms of anemia, but in reality, if injudiciously prescribed it may not only fail to cure, but may produce bad results; and observations of such instances have led some to deprecate a remedy of the very highest value." Phillips states that iron is of benefit in the treatment of hemorrhage, leucorrhea, empyema and suppurations, seminal losses, profuse perspirations, diarrhea, prolonged lactation or too frequent pregnancies, rheumatism, dyspepsia, inanition and many other ailments, especially if the cause be removed. It was his opinion that "in simple anemia if iron medication is not continued for a considerable time after the disappearance of formidable symptoms, the malady returns in an aggravated degree."

While the clinicians were engaged in heated disputes over the relative merits of organic as compared with inorganic iron there began to appear numerous reports of experimental studies on iron, especially concerning the absorption of various forms of iron. In 1886, Zaleski demonstrated the presence of iron-bearing bodies in various tissues of the body. This work was later confirmed and extended by Spitzer. The interchangeability of iron in food with iron in human tissues was demonstrated by Dastre and Floresco in 1890. In 1894 McCallum and Hall, working independently, traced the absorption of inorganic iron salts through the mucous membranes of the gastrointestinal tract in animals. The same was done in man several years later by Hofmann. Quincke and Hochhause in 1895 actually traced the course of iron as it was absorbed from the small intestine into the lymph channels and thence into the blood, and showed that iron was stored in the spleen and liver as a reserve to be drawn on when needed by the blood. In 1899 Lichtenstern published results of experimental work showing that iron-bearing food caused an increase in iron of the blood and tissues in man. Schmiedeberg, commenting on this work, stated that iron as it exists in food is "undoubtedly the blood-forming combination." A few of the more significant experimental contributions have been mentioned. A comprehensive review of the early work is given in the article by Hall already referred to. The later work has recently been reviewed most ably by Robscheit-Robbins, who sums up as follows:

> Iron has always enjoyed the greatest popularity among clinicians. Style of usage changes rapidly; at one time the question is organic or inorganic, followed perhaps by soluble versus insoluble; this may be succeeded by a popularity of ferro against ferri salts, and more recently several publications have dealt with the so-called active magnetic form in comparison to inactive non-magnetic iron. Dosage also is given much emphasis, particularly at present; small doses are considered ineffective while very large ones are believed to result in much benefit to the patient. The literature on the subject is voluminous.

No historical review of iron therapy would be complete without reference to a paper by H. A. Christian, published in 1903. This article is called "A Sketch of the History of the Treatment of Chlorosis with Iron," and is rich in mythological and historical references to the use of iron. But, unfortunately, as the title implies, it is only a "sketch," even when compared with the present brief survey.

The epoch-making work of Whipple and his collaborators has finally placed iron therapy on a sound scientific basis. Many of the ancient empirical uses of iron have found justification as a result of adequate and accurate experimental and clinical observations. It is interesting, however, to find as late as 1920 the following statement in a paper by Whipple, Hooper and Robscheit: "Blaud's pills are inert when added to various diets which do or do not favor rapid blood regeneration. We may not assume without positive proof that inorganic iron is of value in the treatment of secondary anemia." This statement was corroborated by Musser in 1921. Further observations disclosed the fallacy in this conclusion, for when anemia was associated with iron depletion there was a decidedly favorable reaction to iron therapy, which Whipple found to be "the most potent metal . . . in severe secondary anemia due to hemorrhage in dogs." The early experiments had been of short duration, and the therapy had consisted of two Blaud's pills daily. There is still some difference of opinion concerning the optimum dosage of iron, but most observers find that the best results are obtained when relatively large doses are given, thus substantiating the earlier observations of Sydenham and others. Many physicians prescribe iron compounds containing the equivalent of 2 to 3 grams of elemental iron daily. Recent work seems to indicate that the efficacy of iron can be increased by the addition of small amounts of other metals, especially copper, and by feeding a diet that produces an acid ash. It would seem superfluous to attempt a review of the current literature on iron therapy in all its variations.

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MADSTONES

WITH AN ACCOUNT OF SEVERAL FROM VIRGINIA*

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EMBEDDED in the folklore of many nations is a belief in the efficacy of all sorts of medicinal stones and among them the madstone is of particular interest. Madstones have been variously known as snakestones, Chinese snakestones, Indian snakestones, serpent stones, adder stones, sucking stones and bezoar stones. Typical specimens are usually small, light, porous, stonelike objects, often with one surface flattened. They possess definite absorptive qualities and are believed to be capable of extracting the poison from a poisonous bite, especially the poison of a mad dog. Objects from many sources and of many different compositions have been considered to possess the miraculous powers ascribed to madstones, but in general real madstones are composed of (1) a light porous substance made by a secret process such as was known to certain natives of India; (2) some porous form of calcareous rock, such as halloysite, a mineral capable of absorbing moisture with avidity and of adhering to moist surfaces until nearly saturated; or (3) concretions recovered from the intestinal tracts of herbivera, such as enteroliths, calculi, and hair balls.

To extract the poison from a wound the stone was first moistened. The flat surface was then applied to the surface of the injury, and the stone was held in position by bandages for a given number of hours, eight or more, though it often adhered of its own accord. It was then removed and placed in warm milk. If bubbles and a greenish color appeared in the milk the stone was supposed to be giving up the poison it had extracted. The stone was then reapplied to the surface and theoretically the process was kept up until no further bubbles and no more discolorations of the milk were to be observed.

The theory upon which these porous stones were used was clearly one of physical absorption. Some have been shown to increase their weight as much as 5 per cent when applied to a wet surface, but in a number of instances well-controlled experiments with animals injected with snake venom have clearly demonstrated the utter worthlessness of the madstone.

The explanation of the popularity of the madstone is due to the fact that contrary to common belief most dog bites are inflicted by animals who are not mad and are therefore of themselves harmless. Extreme fear is usually associated with the bite of an animal supposed to be poisonous and this fear may well be effectively combatted by the application of a stone around which hovers the aura of many previous successful cures.

Madstones of course have no intrinsic value, but the reliance placed in them by simple folk made them frequently bring large prices. In the Middle Ages they are said to have sold for the equivalent of from $5 to

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$350. Their historic value as objects connected with the life of a people makes them valuable today to collectors and museums. Recently one is said to have been offered the Smithsonian Institute for $1000. Rudolph of Venice had a fine collection. There are collections in the Hofmuseum, Vienna, and the Museum of Scottish Antiquities. Inquiry among a number of American museums revealed none except in the United States National Museum (Smithsonian). Here six specimens have been preserved. One or two are of doubtful classification. One is of halloysite; another is a highly polished seed of the Kentucky coffee tree; another is the gallstone of an ox; another is a pebble of calcium carbonate reputed to have been found in the stomach of a deer by an Apache Indian of New Mexico. This may have been a pebble swallowed by the deer as its surface is etched by the action of the digestive juice. Another is a "brown, striated porous pebble" purchased in Wisconsin and said to have cured a victim of mad dog bite. One is a "matted ball of hair such as is occasionally found in the stomach of domesticated cattle, buffalo and perhaps other ruminants."[1]

Belief in the madstone is found somewhere in the records of nearly all nations. A search of Pliny's "Natural History" however is disappointing. He who wrote so much of what went on in the Roman Empire about the time of Christ makes no mention of them, although he gives many current remedies for the bite of a mad dog—the liver of a he-goat, the dung of a she-goat, of a badger, cuckoo and swallow, the menstrual blood of a bitch, and a receipt often on the tongue of every mother's son of us: "the hair of the dog is good for the bite."

The Abbé Grossier in his "Description of the Chinese" gives one of the earliest accounts of these stones in Tang Kiang, calling it a Chinese snakestone. A Chinese work by Chu Yu, dating from the twelfth century, mentions madstones and advises that they be worn in finger rings.

In the thirteenth century, Ibn Baitar, in his "Collection of Simples," quotes the works of older Arabian authors who describe the Bezoar stones, and assigns to them the power of neutralizing poisons.[2] Abu Mansur, in the oldest Persian work of medicine mentions them.

Several old as well as modern writers refer to snakestones in India. Jean Baptieste Tavernier in his "Travels in India" written in the seventeenth century records the fact that the natives believe these stones grow on the heads of certain serpents. He himself thought that most were of some synthetic composition, but he believed them none the less effective when properly applied. He refers to the custom of steeping the stones, in order to cleanse them after use, in human milk.[3]

Thevenot thought the Indians made the stones from the ashes of the root of a certain plant mixed with clay.[4] A more recent writer on Indian madstones quotes the owner of one as saying:

> These stones are prepared by religious hermits who live in the heart of the virgin forests, and who give themselves up to vows of various kinds, in all of which charitable acts predominate. These mendicants give these stones to snake charmers as a guard and antidote against accidents, which often happen in their dangerous calling, and snake charmers

in turn may give away these stones but never sell them.

The part bitten should be slightly moistened with water and the stone applied, the stone will adhere very firmly to the spot and after a time it will drop off, having absorbed all the venom. If the stone now be quickly immersed in a small quantity of milk the poison absorbed by it will exude and the milk will turn blue.[5]

Another recent writer refers to the popular belief that the stones are often to be found in the hills and represent the solidified saliva of certain wild goats.[6]

In the fourteenth century prose Edda of Icelandic literature there is reference to medicinal stones.

The bezoar stones are first encountered in Europe about the tenth century. They were highly prized by the populace and the princes who often forced their use upon physicians. Returned Catholic missionaries are said to have brought them to Italy. Francisco Redi, who gave the first jolt to the then respectable doctrine of spontaneous generation, attests their extraordinary healing power in his "Experimenta" written in 1685. He speaks of their having been recovered from the heads of certain Indian snakes and states that they cling like a cupping glass to a poisonous bite or wound until they have extracted all the poison. He mentions the necessity of placing them in milk to remove the poison, saying that the milk should turn yellow or green. He records an interesting experiment on a rooster, in which not being able to use the poison of a serpent or a mad dog, nicotine was rubbed into an incision in the leg. A madstone was applied by monks and the observers were amazed that the rooster survived eight hours.[4]

In France we read of Ambroise Paré taking part in an experiment to determine if a bezoar stone could save the life of a criminal who had been given a lethal dose of the bichloride of mercury.

In England we find mentioned among the effects of Queen Elizabeth "one greate Bezar stone . . . one other large Bezar stone, broken in peeces delivered to our owne handes, by the Lord Brooke."[7]

In Somersetshire and Cumberland madstones are said to be in use to this day. In Northern Scotland particularly stones and crystals have been long cherished for their healing power. To the Highland Exhibit in 1908 many of the clans lent their medicinal stones. Madstones have been described in Dutch South Africa.[8] Java has furnished some of them.[9]

Most interesting from a literary point of view are two stones, each believed by its owner to be the stone referred to by Sir Walter Scott in "The Talisman." The first is described in the *Encyclopedia Americana* as having been brought from Scotland in 1776 and as being in the possession of a Virginia family named Fred. It was chocolate colored and measured 2 × 1 × ½ inches. No less than 130 persons were reputed to have been saved from hydrophobia by it.[10] The second is reported by Charles W. Dulles as an authentic Virginia madstone whose owner believed that it was the Talisman "sent by the Sultan as a wedding present on the occasion of the marriage of the Earl of Huntingdon to Edith Plantagenet." How true were these claims must be left to the imagination.[11]

The closing paragraph of Scott's novel reads:

The Soldan sent, as a nuptial present on this occasion, the celebrated Talisman; but though many cures were wrought by means of it in Europe, none equalled in success and celebrity those which the Soldan achieved. It is still in existence, having been bequeathed by the Earl of Huntingdon to a brave knight of Scotland, Sir Simon of the Lee, in whose ancient and highly-honoured family it is still preserved; and although charmed stones have been dismissed from the modern pharmacopoeia, its virtues are still applied for stopping blood and in cases of canine madness.

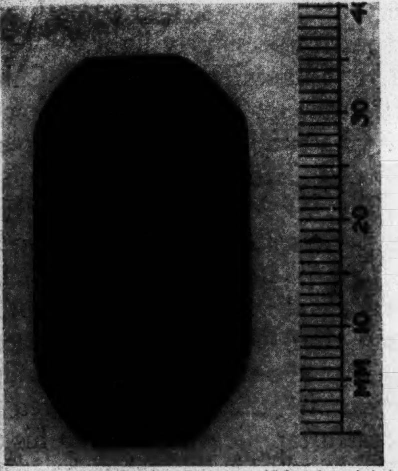

FIG. 1. Micou Madstone. Long used in the vicinity of Tappahannock, Virginia.

It will be recalled that Scott in the Introduction to "The Talisman" gives the historical source of his narrative and tells how Sir Simon Lockhart of Lee and Cartland, in the crusade on which he accompanied the good Lord Douglas, custodian of the heart of Robert Bruce, made prisoner in battle a wealthy emir. Among the ransom articles which he extracted from the captive's aged mother was a notable talisman. After "much experience of the wonders which it wrought" it was carried back to Scotland and passed from one heir to another, being distinguished by the name of the Lee-Penny. At a time when the Church of Scotland was eagerly impeaching every other cure that savored of the miraculous, it exempted this stone as possessing certain healing virtues which it did not presume to condemn. This action taken by the Scotch Synod sometime between 1596 and 1674 is fully recorded in the notes to "The Talisman."

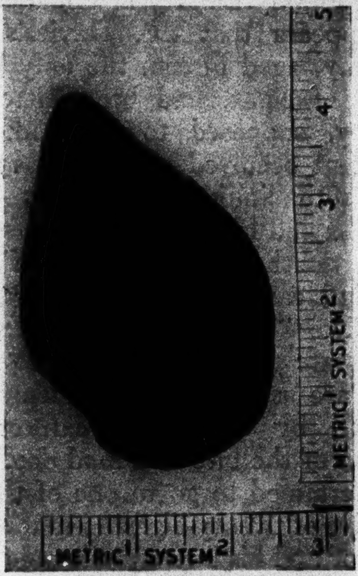

FIG. 2. Stevens Madstone. Used for many years in the vicinity of Lynchburg, Virginia.

On April 8, 1861 Sir James Y. Simpson presented an important communication to the Scottish Society of Antiquaries "On Some Scottish Magical Charms and Curing Stones." He exhibited the Lee-Penny and observed that "in the present century this ancient medical charm-stone has acquired a world-wide reputation as the original of the Talisman of Sir Walter Scott, though latterly its therapeutic reputation has greatly declined, and almost entirely ceased."[12]

For information in regard to two other Virginia stones, the Cabin Point and the Matthews stones, we are indebted to a letter, written in 1801 by Dr. Samuel Davies of Petersburg to Dr. Benjamin Rush, now preserved in the Ridgway Library in Philadelphia. It appears that Dr. Davies's son, Sammy, aged fifteen, the only living child of eight, had been bitten by a dog, supposed to be mad. The accident occurred on August 17. On the 18th liquid caustic was twice applied and later blister plasters were put over the areas. In spite of these heroic measures, Dr. Davies was not satisfied. "We have," he wrote, "in this state several Sucking Stones (as they are usually called) which it has proved by experience, extract the poison of the bite of a mad dog. . . . I determined to go to one of them." A drive of twenty-eight miles took the Doctor and his boy, by this time quite sick from repeated cauterizations, to Cabin Point. The stone appeared to be disappointingly small: "not so long in its broadest part as the 1/16 of a dollar," having been reduced to that size by the teeth of a horse, while being treated for a mad dog bite on the mouth. It was triangular, bluish in color, smooth and very light. It was promptly applied to Sammy's wounds, which by the way had now sloughed to the bone, for twelve hours each day until the 27th. At this time Dr. Davies discovered that no bubbles had arisen in the water in which the stone was washed, and immediately lost faith in the cure. He hastened with his son to another stone in Matthews County. From September 1st to the 4th this stone was applied to the raw wounds and the favorable sign of bubbles was for the first time observed. After this father and son were sent home assured by the owner of the stone that "no bad effects would ever be experienced from the bite." For this stone 300 guineas had been refused. It had saved the lives of at least 500 persons. It was yellow in color, exhibited on the top and bottom many black pores, had smooth edges and was impressively light.

The Chaustien Stone, a Chinese snakestone once in the possession of a Mr. Chaustien of Frederick County, was described by Mr. William H. Harding of Virginia in 1806[13] as a flat, porous stone about the length of the first phalanx of a man's thumb. A certificate which accompanied it stated that it had been purchased in Bombay about 1740. Mr. Harding's interest in the stone followed the successful application of it to his own four-year-old child who had been bitten by a dog supposedly mad. This stone was said to adhere only to wounds due to poisonous bites. It was usually kept in position for twenty-four hours. Every eight hours it was immersed in hot water and a greenish scum appeared on the surface, indicative of extracted poison. The owner claimed to have employed it successfully in 80 cases. It appears that Mr. Chaustien had possessed another stone acquired in the lower part of Virginia but discarded after it was broken. He seemed to be "a very benevolent man," says Mr. Harding, not desirous of making money "as in many instances he does not charge at all, and when he does exhibit a charge it is so very low as to make him but a small compensation for accommodating his patients."

The Micou stone was sent me to examine and photograph in 1929 by Mr. James Roy Micou of Chestertown, Maryland. Mr. Micou is a descendant of Paul Micou, a Huguenot refugee who was born in France in 1658, and whose black marble tombstone, still standing at Port Micou on the Rappahannock, bears the inscription "Here lies the body of Paul Micou who departed this life the 23rd of May, 1736, in the seventy-eighth year of his age." How long this madstone has been in the Micou family no one knows exactly, but Mr. Micou says there is a family tradition that his grandfather purchased it for thirty acres of land. It passed through the hands of successive Tappahannock physicians until it came into the possession of the present owner. William C. Garnett of Dunnsville, Virginia, in his book "Tidewater Tales" says that once he saw this stone used, and that when it was put into water greenish bubbles appeared upon the surface which seemed to produce a highly satisfactory feeling in the patient. It was applied to the bite of a mad dog after the familiar technique, adhered firmly while doing its work, and dropped off when all the poison had been absorbed. It is of a mottled yellowish color, porous, quite light, and measures 35 × 20 × 9 mm. It is shaped like a coffin-lid and is set in a plain silver band.

The Stevens stone, the last to which I wish to refer, was originally owned and employed by Dr. John Stevens, a medical practitioner in the neighborhood of Lynchburg, Va., about the beginning of the last century (1800). Dr. Stevens was the maternal great-great uncle of Miss Julia Sully of Richmond, who inherited the stone and presented it to Dr. Stuart McGuire, who in turn presented it to me. Dr. Stevens is reputed to have carried it in his saddle bags. In the emergency of a snake or mad dog bite it was applied in the usual way and afterwards the caution of steeping it in warm milk was faithfully followed. This stone was said to have come from the stomach of a deer.[14] It measures 38 × 24 mm. and weighs 8 gm., is light brown in color, somewhat pyriform in shape and at the more pointed end there is a perforation capable of admitting a small cord which might have been employed either to hold the stone in apposition to a wound or to afford a convenient method of carrying it. The surface is generally smooth except where use has worn it away. The exposed internal structure is suggestive of bony lamellae[15] and one wonders if this may not have been one of the carpal or tarsal bones of some animal. One surface is doubly facetted and is inscribed "June 45." There are well-worn letters on other surfaces which cannot be satisfactorily deciphered.

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14. Some lower animals have no gall bladder, among them certain species of deer. The subfamily moschinae have a gall bladder but no antlers. The cervinae have antlers but no gall bladder. As they are the deer commonly found in Virginia the stone is certainly not a gallstone.
15. An *x*-ray of this stone shows typical bony structure.

FACT AND FICTION IN THE NAMES AND TITLES OF PARACELSUS

By ROBERT E. SCHLUETER, M.D.

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"AUREOLUS Philippus Theophrastus Bombastus ab Hohenheim, der heiligen Schrift Professor, der freien Kuenste und beider Arznei Doctor, Medicus et Germaniae Philosophus, Monarcha medicorum et Mysteriarcha, chemicorum princeps, Helvetius Eremita"[36] is so extravagant a title, that it is not easily overlooked. One language is apparently inadequate for such a flourish. Still, if it were found with reasonable uniformity in the literature of our subject, it would strongly attract the eye, without arousing a spirit of inquisitiveness or research. However, the almost limitless combinations presented by various authors, of which hardly two give the same assortment, have excited the curiosity which led to this inquiry.

Practically everything concerning the greatly abused and very abusive[34] Paracelsus has been and is still being disputed. According to some writers[36] his parentage is uncertain, and his name and sex are not settled beyond a doubt.[35] He has been held responsible for all he did, wrote and said, together with all that which friends and enemies (not forgetting the host of indifferent and enthusiastic sages and fools), uttered and published concerning him and his writings. In general, his name seems to lend itself most readily to almost any purpose, but best to derision and belittlement. After four hundred years the accumulated heap of conflicting jumble has been so often rehashed and expanded that fantastic tableaux are more easily drawn from the tangled material at hand than are honest conceptions which embody only actual or reasonable facts. It is at times amazing how, from all this heap, the piercing eyes of national and partisan prejudice will often deftly garble and utilize little more than the kicks of Erastus[61] and Zimmermann, with the spiteful prevarications of the youthful Oporinus. At any rate, there are writers, otherwise reliable, who have exhibited a peculiar talent for isolating and then assembling considerable of the less reasonable of the reputed happenings to Paracelsus,[6] with or without that which has been certified as correct.

A man who writes: "Der hoechste Grund der Arzney ist die Liebe" (The loftiest premise of Medicine is Love),[40] cannot be altogether wicked and ignorant. Whatever estimate or classification is made of him, Paracelsus certainly was no ordinary average man.[45] This modest effort was undertaken to ascertain what is deserved; and, also to determine, without presuming to utilize all available material, what was gratuitously thrown in for one reason or another. The merit of his contributions and other phases of his life and character are matters decidedly foreign to this investigation.

Shortly after birth at Maria-Einsiedeln, Canton Schwyz, Switzerland, on November 10, 1493, he was christened Theophrastus Bombast von Hohenheim. His father was Wilhelm Bombast von Hohenheim who had received his medical degree at Tübingen in Wuerttemberg. This was, very likely, his native country where also the ancestral castle "Hohenheim" is still preserved near the town of Plienigen. Conrad Bombast von Hohenheim lived there in 1270. This progenitor, and later ancestral heads of that family, collected certain tithes and revenues from the neighboring towns, villages and lands. In 1432, or 1409,[6] these rights were sold by Conrad's descendants along with the feudal tenancy of the castle. The family of Bombast von Hohenheim was of the high nobility, or none could have entered the Order of the Teutonic Knights of St. John, in which one of them attained the high rank of Grand Master. In 1481, Wilhelm Bombast von Hohenheim was summoned from Wuerttemberg (Suabia) to become physician to the pilgrim hospital at Einsiedeln.

In 1491, he married a "woman of the house of God" (*Gotteshausfrau*), named Ochsner. Her father was probably Rudi Ochsner. She was not the matron or supervisor[23] of the hospital, an oft-repeated error.[8] "People of the house of God" (*Gotteshausleute*) were subjects of the jurisdiction of a cathedral, church, convent or monastery. They had definite obligations to the abbot or bishop, like members of a parish, but rather more binding than is now the accepted interpretation.

The idea of the lady's connection with the hospital most likely originated in France in consequence of a literal translation. House of God, in French, is "Hôtel Dieu." This is a favorite name for a hospital in that country, and almost every city of some size in France or in the French colonies has its Hôtel Dieu. What the French understood, tolerated translation into other languages and retranslation into German without consulting the original text, and so this mistaken impression is sure to turn up occasionally.

Wilhelm Bombast von Hohenheim's only son, Paracelsus, was christened Theophrastus after Theophrastus Tyrtamus of Eresus to whom the adjective "aureolus" had been applied.[9] The studious father might have playfully called his son Aureolus and as a baptismal name, it would be decidedly proper. It could have originated with the mother as "Mein Golder," and latinized by the father.[56] His later admirers seem also to have used this pet name, but only once during his lifetime (in 1538) do we find Aureolus used, and then in the title of a document.[3] Robert Browning[5] in his pretentious poem calls him Aureolus Paracelsus. Aurelius,[44] however, was always wrong. "Phillip" was never used by Paracelsus himself, though it might have been added at the baptism to supply the customary saint's-name. We find Philippus Theophrastus for the first time on his gravestone erected by friends after his death, and it is often applied even today. On this tombstone the portrait of his father was placed by mistake and has remained.

Regarding this error, it might be of interest to note that in the university library at Leiden there is a manuscript mentioning numerous dates between April, 1588, and September, 1595. It contains a story concerning a "magician, Wilhelm Bombast, boldly called *Theophrastus Paracelsus*." Other tales confounding father and son might be traced back to this dualism. Sometimes, too, a suspicion arises in the minds of honest historians that some of the son's accredited works could have originated with the father. Still, no strong support for this thought can be discovered. The father's record is more obscure than that of the son and his relatively short career (Ref. 16, vol. 2, p. 185).

There is also a Latin manuscript having the date 1605 on its parchment cover, in the Vienna Court Library (Ref. 16, vol. 2, p. 187). It mentions "the father of Paracelsus" as having functioned as barber in the family "Bombastiorum abs Hohenhaim," and participating in the Peasants War. It is just another one of those legends, suitable for popular consumption, arising from the wonderment created by our Theophrast's great knowledge of nature's secrets. During this war (1524–1525), the parent was living quietly at Villach in Carinthia, Austria.

At this point it might also be a pardonable digression to call attention to a unique example of subtle humor (Ref. 16, vol. 2, p. 498). In the Court and State Library at Munich, there may be seen a Paracelsian manuscript, mostly theological, dated A.D. 1588. On the inner side of its front parchment cover is a lead-pencil memorandum informing us that the last descendant, a great-grandson, of Paracelsus lived in upper Hungary in 1829, and that this noted and honored citizen was a Baron von z Haller. (Three centuries is a long time to wait for a fourth generation, even of a bachelor, to bob up. Furthermore, this note fails to tally with the earlier contribution about the castration of Paracelsus by a boar, or by his own father. Those persons who took liberties with this man's antecedents, personality and fabricated posterity have failed to arrange a proper protective understanding with one another.)

When we find him called Theophilus,[4] it is at best a grievous error which is an indication of the lack of accuracy on the part of that author. Even a sort of synopsis of medical history,[7] which omits Paracelsus altogether, at least does not lead its readers astray.

Bombast is the family name of the von Hohenheims of which the male issue was extinguished in 1574, by the fatal shooting of Franz Bombast.[8] Late in the nineteenth century there were still Bombasts in Wuerttemberg,[9] notably in villages formerly belonging to the lord of von Hohenheim castle. It is highly probable that they are not yet extinct. "*Baum*" is German for "tree." In the Suabian dialect it is "*Bom*," pronounced "bome" or "boam." "Baumbast" or "Bombast" is the fibrous layer, or bast, of the bark of a tree, which is the layer closest to the wood. It is tough; hemp and linen being that layer of their respective plants.

The term Bombast (low Latin: *Bombax*) is one of the several names for cotton, a product known in prehistoric times. Plautus (about 254–184 B.C.), a writer of comedy, employed the interjection "bombax" as an exclamation of wonder, surprise etc.[11] As this material, cotton, was and is still used for padding, stuffing, distending and expanding garments, the term has long been applied to pompous and inflated speech. Used as a verb, it denotes: to swell out, to pad, to inflate, to fill out.[12]

Fustian is another synonym of cotton. Magniloquent and boastful written or printed statements are called "fustian" for the same reason that utterances of this sort are termed "bombast." Paracelsus did no more inspire a new application for bombast than his coarse, boastful and antagonistic writings or speech could have prompted the coining of fustian. Still, every now and then we are told that bombastic and bombast derived another meaning because of him.[4] That man who originated the idea that the noun "bombast" and the adjective "bombastic" were added to our languages by applying the patronym of Paracelsus to his own volcanic temperament and the forceful exposition of his principles[4] has added another accomplishment to Hohenheim's many achievements. Any individual who can increase the vocabulary of future generations by words which describe such a distinctly personal characteristic trait, carries his influence farther into future generations than could be expected without that form of accentuation of such an outstanding and attractive feature. This credit, nevertheless, is misapplied and quite without foundation. It is probably also the product of a mind, however resourceful, yet unable to penetrate the fog of prejudice to recognize a progressive philosophy because of its great clarity and simplicity in reasoning. Therefore, it casts its myopic eyes upon this titular segment and carries the thought into a realm which was explored and charted long ago.

This proper name "Bombast" is fairly often extending to "Bombastus." Usually the latter spelling is found in a pleonasm where all words except "von Hohenheim" have the same ending.[17] Here a latinization ought not be objectionable; yet it looks prettier and is definitely correct as plain Bombast.[18] No suffix can improve it in any manner. Samuel Butler, in his "Hudibras" simply calls him Bombastes. In general literature such liberty attracts little attention, but when we see "Bombastes Furioso"[4] it is nothing short of shocking. This was the title of a popular burlesque tragic opera written by William B. Rhodes in the year 1810.[19] The farce is a travesty upon "Orlando Furioso,"[20] the masterpiece of Ludovico Ariosto (1474–1533), and concerns a general in the army of Artaxomines, King of Utopia (Ref. 16, vol. 1, p. 689). Neither contains anything referring to Paracelsus. When such foreign material is employed the reliability of the authors comes into question, unless the intention of a humorous treatment of the subject is made clear. As already stated, almost everything concerning this man has been refuted at some time or another. Even the year of his birth, 1493, has been disputed. His right to "von Hohenheim," however strongly supported by documental proof, was denied him in at least one original wrong assertion. According to this statement his name was Hoehener and he was born at Gais in Appenzell. Albrecht von Haller, in 1777, brought this false name into prominence for the first time.[8] It was based on a statement in a letter by one Laurentius Zellweger and a publication by Johann Caspar Zellweger.[8] It has also been copied into some of the more recent writings.

While we know nothing of the life, activity and death of his mother, there is positive proof that his father moved from Einsiedeln to Villach in Carinthia, Austria, in 1502. The young Theophrastus accompanied his father, Wilhelm Bombast von Hohenheim. After thirty years of residence in that Austrian city, the parent died at Villach on September 8, 1534. There is also abundant evidence that father and son never failed to show the proper mutual respect. The records of the town of Villach are clear upon the parentage of Paracelsus, whose last testament also recognized his obligations to the abbot at Einsiedeln. That

Hohener, Haehener, Hoehener, Hochener[22] Hoechner and Hoechener are colloquial corruptions of Hohenheim, is so far fetched that no further consideration of this is required. These assorted spellings of the same name, appear to have been added by inaccurately reading some of the statements,[8] most of which can be traced back to the afore-mentioned Zellweger, reputed bailiff in Appenzell. All has been disproved by the unequivocal testimony of relatives and officials,[35] and supported by legal records and other documents. There is another angle to this situation. It permits blending with the supposition that the last feudal prince of the von Hohenheims settled in Appenzell after disposing of his Suabian estate and took on the plebeian name "Hoechener."[6] It has also been added, that several Hoecheners moved to Canton Schwyz, and returned to the original cognomen.

Nor was Hohenheim consistently spelled exactly so. Provincial, dialectical and foreign nationalistic variations have been assisted by carelessness and other factors to produce Hohenheym, Hohenhaim, Hohenhaym, Hohenheimb, Hohenhaymb, Hochenhaim, Hachenheim (Ref. 16, vol. 2, p. 223), Hachenhaimb,[10] Hohenstein (Ref. 16, vol. 2, p. 593), van Hogenheym (Ref. 16, vol. 1, p. 501), Hohenheimer (Ref. 16, vol. 1, p. 483) and other forms. In several manuscripts (Ref. 16, vol. 2) it is abbreviated into H.H.H.

The why and wherefore of the specific term "Paracelsus" warrants a more or less detailed explanation. According to the spirit of the times, students usually migrated from one university to another, as a sort of journeymen, acquiring an education. This led them into foreign countries where their mother-tongue was little understood. Not much difficulty was encountered in the work within the schools, for all studies and instruction at European universities was conducted in Latin. However, not a few of the native students at certain centers of education were unable to pronounce the foreign proper names.

Paracelsus was the first man who dared to teach in the vernacular at any university[53] when he lectured in German at Basel in 1527.[50] This audacious innovation was one of the several factors which increased his unpopularity in the academc circles of Basel and was not readily accepted by other instructors there or elsewhere. Educators were so slow in following the example of Paracelsus, that Josef Skoda was the first to use his mother-tongue at the University of Vienna, Austria, in 1847,[28] obtaining special permission from the higher authorities of that school. Some of the German medical historians wrote in Latin,[39] even until the nineteenth century. The uniformity in employing the Latin language of science was quite an advantage to students who could by peregrination thus acquire a broadness of knowledge that afterwards made them leaders among men at home. There was, however, a tendency to fit their own names into their academic discussions and writings by latinizing or grecizing them. These changes were very welcome to many fellowstudents, particularly in the Latin countries of southern Europe, when a student with a Germanic or Slavic name arrived among them. Italian, French and Spanish names usually were latinized by a short suffix which attracted less attention than the obviously necessary alterations in those from the northern areas. More than a few men of distinction never returned to the use of their original patronym.

Without further comment, it might be well to mention a few of these: Erasmus Desiderius (1467–1536) was the illegitimate son of a man named Gerhardt; Oecolampadius (1482–1531) was Johannes Huessgen, or Hauschein; Regiomontanus (1436–1476), was Johann Mueller, of Koenigsberg; Melantchon (1497–1560) was Phillipp Schwarzerd; Comenius (1592–1671) was Johann Amos Komensky; and Copernicus (1473–1543) was Nikolaus Koppernigk.

Paracelsus (1493–1541) very likely helped himself to this convenient change during his student wanderings. The Latin noun "*celsus*" (a high place), is a suitable Latin translation for "Hohenheim." However, Celsus was a Roman philosopher, and Aulus Cornelius Celsus had been a Roman physician. *Para* is a Greek prefix signifying along side of, beside, beyond, against, or amidst.[12] Reverence and admiration of these noted predecessors, and the shortness of the word "celsus" being unusual among academic cognomina of that day, no doubt prompted the use of that prefix, to make "Paracelsus."

Harsh critics and some admirers have insisted on interpreting its meaning as *Superior, beyond,* or *farther* than Celsus.[41] Nevertheless, even if we construe the crassest conceit and vainest presumption from his later writings, we must remember that Paracelsus chose this name during his student years. The fact that he and his kin had ceased to reside at the ancient Hohenheim and therefore were "beyond the high place," could have influenced him. But, it would be far more natural for a young man, preparing himself to enter a learned profession, to vision a place for himself "along-side of Celsus"; or, feeling with pride that he has been admitted to the same profession, "beside Celsus." With the latter construction "Paracelsus" appears not only appropriate, but directly shows decided earmarks of beauty. Constant association with the sentiment, expressing the privileged position "*beside Celsus,*" may likewise have been a stimulation to strive to be worthy of such an honor. And every anti-Paracelsist, however severe, must admit that Paracelsus worked very hard; he seems also to have had a leaning toward this prefix. "Paramirum" and "Paragranum" are the titles of two of his important works. Several editions of these and other writings which were published after his death mention "eremi" or "eremita." That Erasmus of Rotterdam called him "Helvetius Eremita,"[10] must be accepted as a fact, because of its plausibility. Of course, this was a nickname. The first part is derived from Helvetia, the Latin name for Switzerland, and the rest from Einsiedeln (Hermitage or Eremitage);[10] however, when we read "Erasmus called him Paracelsus Emeritus,"[52] no rational explanation for it being at hand, it must be considered an error. "*Confoederatorum eremita*" (Ref. 16, vol. 1, p. 289), indicating an erstwhile membership in one of the religions orders of hermit monks, is not substantiated by records.

There are also a few more secondary of by-names. That he was sometimes called "*Germanus*" is quite natural. "*Alpenus*" is equally correct for a Swiss Alpine native. Its reputed derivatives "*Arpenus*" and "*Arpinas*" seem to be misprints or slips of the pen.[10]

It is quite possible that "*Orpinas*" is the real source, but not "*Arpinum,*" the birthplace of Cicero.[10]

In a spirit of familiarity he has been called *Suevus*. The Suevi were a group of Germanic tribes from which the designation Suabia or Swabia was taken. Wuerttemberg is now called Swabia and its people, Swabians. By reason of his intimate historical knowledge, Sudhoff rightly styles him "Stürmer von Einsiedeln"[58] and "dem grossen Einsiedler Schwaben."

"*Cacophrastus*"[9] was coined as an opprobrium only to stigmatize him; it was never intended for serious application; however, when Zimmermann[60] called him "Esel" (Jackass) it was not intended as a joke.

The sobriquet, "Luther of Medicine," is a spontaneous product of the period of the Reformation.[36] "*Luther medicorum*" was the mockery of the collegiates at Basel.[43]

Paracelsus was a contemporary of Martin Luther's, being but ten years his junior. A comparison of these two men, who had definitely similar temperaments and behaviorisms, and each being a heretic in his own profession, could hardly have been overlooked. It was not, however, that they had much in common so far as religious views were concerned, although Paracelsus had some leaning toward the Evangelism of Luther and Zwingli in the year 1531,[8] and while the religious tracts of Paracelsus railed against some of the established practices of the Roman Catholic Church and were particularly directed against the clergy, monks, nuns, and even the pope, he also denounced Martin Luther and other reformers. He never left the religion of his ancestors and always held the blessed virgin in high adoration.[9] Neither can his friendship with Erasmus of Rotterdam, and Oecolampadius, be taken as an acceptance of their religious views. Paracelsus exhibited a complete independence of mind, apparently not admitting that he had obtained much instruction and assistance in formulating his opinions. Among his teachers were such church dignitaries as: Bishop Scheit, of Stettbach; Bishop Ehrhardt, of Lavanttal; Bishop Nicholas, of Hippon, and Bishop Matthew Schacht.[26]

All men, nevertheless, run fairly "true to form," and are in the habit of reacting in about the same fashion to the same stimulus at different occasions. Paracelsus denounced Galen and Avicenna; but his profound reverence for Hippocrates never weakened, for it was undoubtedly inculcated by his teacher, Leonicenus, of Ferrara.[27] Therefore, the influence of those Catholic churchmen who taught him very likely also kept him true to that faith.

Paracelsus, like Martin Luther, attributed potent powers to the devil; both promptly responded most vehemently to criticism and dissenting opinions with violent retorts and sometimes impolite, but never uncertain language.

The subsequent history of the world has still better comparisons than their personal actions during life. Both were revolutionists, Luther changed the Christian Religion no more than Paracelsus has altered the principles of internal medicine and chemistry. The term "Luther of Medicine" is quite appropriate. More so, because Luther cast the papal bull into the flames at Wittenberg, while Paracelsus threw the "Summ der Bücher" into the St. John's fire at Basel.[62]

That Paracelsus provided material for folklore and legendary tales is quite natural, in view of the man and his times. It would have been queer if the fabulists had overlooked this opportunity. Accordingly central Europe has been the recipient of a fairy tale, that has some inalterable features but which differs in detail according to locality. In the main, the story embodies the accomplishments of a celebrated doctor, magician, or necromancer, who was in communication with the devil, performed remarkable cures, and claimed the ability to prolong his life indefinitely; eventually, however, he was slain or poisoned by his enemies. It sometimes seems to have been fused with an older tradition involving a Dr. Johann Faustus, who was perhaps only a myth.[47]

The narratives are not always woven around the same name. Sometimes he is called Doktor Theophrastus, Teofrastus, Frastikus,[46] or Frastus.[47]

Among these stories, as one of the component parts of a pleonasm, the unique nickname "Orpinas"[48] unexpectedly attracts the eye; and simultaneously any curious reader will seek an explanation.

When it is remembered that the tradition stresses the hero's boasted secret of perpetual youth and victory over death, the fitness of its coinage becomes patent. Orpine or Orpin (*Sedum telephium*),[49] also called "live-forever" and "life everlasting," is a hardy plant which grows between rocks, and is able to survive even a severe drought. Its selection as the root for the creation of "Orpinas," who wants to live forever, is an excellent choice, even if the fairy tale bears little resemblance to the life and deeds of Paracelsus.

"Beider Arznei Doktor" merely tells us in plain language that he was a physician and surgeon. In that day but few physicians practiced medicine and surgery. These two branches were far apart; the former being in the hands of educated; while the latter was followed, in the main, by ignorant and often illiterate persons, thus creating a condition which required centuries to change. Now both are equally honorable in the minds of men, as they are alike important in the treatment of human ailments.

In the few remaining authentic specimens of his own handwriting, he signs himself: Theophrastus, Theophrastus Paracelsus, or Theophrastus von Hohenheim. In the twenty-three publications which were printed during his lifetime, only Theophrastus von Hohenheim and Theophrastus Paracelsus are seen; and, while he could have had a voice in the matter, the only other known qualifications, though usually single and only occasionally double, aggregated here for illustration, are: *Hochgelehrten* (most learned), *der heiligen Schrift* (of the scriptures), *der freien Kuensten* (of liberal arts), *Astronomy und beider Arznei Doctor.* All this was by no means extraordinary or astonishing in that Late Renaissance period; but after he was gone and his works became the property of a succeeding generation, the more ornate titles were elaborated. It will not be necessary to explain this entire array in detail. A few examples will suffice.

Montaigne, the great essayist, refers to him as a "newcomer, called Paracelsus."[54]

"Philips Hohenheimer, ein geborner Schwytzer, ein verschmitzter (*cunning*) Mann" (Ref. 16, Vol 1, p. 483) appeared in 1608, and is singularly unique in several respects.

There is little likelihood of anybody finding a prettier chain than the following, which still has, at that, omitted some of the available designations: "Philippus Theophrastus Bombast Hohenheimensis, Svevorum ex panegyricis nobilium Arpinas, Confoederatorum Eremita, Mysteriarcha, Artium magister, Medicinarum professor, Musarum mechanicarum trismegistus, Germanus" (ibid., p. 289).

It seems as if many of the authors endeavored to raise the importance of their works by employing all sorts of superlatives to magnify the high rank among the nobility of science where they placed their idol. "Prince of physicians," "erfarnen Fuersten aller Aertzeten," "Edlen Ehrwirdigen Herren," "Philosophi & Medici incomparabilis," "Monarcha sapientissimi," "Summi inter Germanos medici," "Medicorum Monarchae & Principis Helvetici," are a few of the titles bestowed upon him between the year 1575 and 1697,[16] which comprises the most prolific period in the output of Paracelsan editions. They varied greatly in every respect and some bore little resemblance to early and previous works. Nothing in them can be styled authentic, unless corroborated in the earlier printings.

To discuss whether or not Paracelsus was a charlatan,[51] quack,[44] mountebank,[53] thaumaturge,[60] or other form of imposter, would avail us little at this time. It is a tremendously broad subject that merits separate treatment. "Cet insolent souffleur de cendres, ce vagabond, ce distillateur impudent"[52] belongs in the same category.

And so on, almost ad infinitum.

Strangely ludicrous as some of these quoted word-tapeworms might appear, they have been linked together in the effort to contribute something favorable or derogatory to Paracelsus. As a rule,[36] a fairly good idea of the author's aims and intentions can be gained by a glance at his selection and arrangement of the several parts of this man's name; but, this is not always a reliable sign. Sometimes astounding statements can be found in places where they are least expected.[29] That he was born at a spot called "Das Hohe Nest" (The high nest), about one hour's distance from the celebrated monastery or cloister of Einsiedeln,[25] and from it took the name of Hohenheim, is an absurdity. If there was such a place, it can easily be a pleasantry or a good-natured descriptive title for a modest country-place of the Hohenheims at a high location.

If these paragraphs will aid the English authors of the future in determining what he "called himself or was called,"[4] and help these writers in obtaining a more correct idea of the whole subject, they will have attained their sole purpose. Multiple or complex titles and names are only useless encumbrances upon the bearer, and all those who either approve or oppose him or his principles during his life or thereafter. The terse uncomplimentary statement of one American author[51] suffices to prove this.

By the use of pointed epithets, antagonists derive only momentary benefit for their cause. Sober deliberation will await the dissipation of any artificial mist, and only then can a reliable estimate be made. The value of that which went before is only in proportion to the encouragement and inspiration which lies in it as an example and to what near or remote posterity can extract from it.

All genius is judged by minds of inferior quality. Entrance into controversial discussion is not synonymous with ability to comprehend all its details. In the end a principle will either rule, or be lost.

"Was allen ausserordentlichen Menschen begegnet, dumm gelobt and dumm getadelt zu werden, war auch Paracelsens Schicksal" (Christoph Martin Wieland.[13]) (What all extraordinary persons encountered, to be stupidly praised and stupidly blamed, was also the lot of Paracelsus.)

The certain futility of minimizing; and, the sheer uselessness of expanding any historic occurrence or effort, has been frequently verified. Both the admirers and the adversely minded of Paracelsus can find no permanent advantage in juggling and contorting the least of him—his name.

Like many a noted or obscure figure, Stephen Grover Cleveland eventually became just plain Grover Cleveland to us; and, Thomas Woodrow Wilson finally contracted himself into Woodrow Wilson. Neither of these men suffered any loss thereby and the world is unburdened of just one-third of each name. It behooves us, therefore, in justice to ourselves and our descendants, as well as all posterity, to urge a shorter and simpler term for this man.Theophrastus Bombast von Hohenheim, Theophrastus Paracelsus, or Theophrastus von Hohenheim are eminently correct. Better still is the tersely distinctive: Paracelsus.

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HISTORY OF JEWISH PHYSICIANS IN THE UNITED STATES

UP TO ABOUT 1900

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WHAT could be more significant of the important rôle that the Jewish physician has always played than the presence of two Hebrew physicians on the ships sailing to the New World under the leadership of Christopher Columbus. At this period, Jewish physicians in Europe were, however, not in the highest standing. This was due to many factors, most important being their almost complete exclusion from the universities during the latter part of the Middle Ages and indeed until the time of the French Revolution. Hence, there were few well-trained Hebrew physicians in the period from 1400 to 1800, but even the few were much in demand as court physicians, although before 1400 they were among the leaders of the profession in Europe and in the Moslem territories.

The day before Columbus left Spain in 1492, there began another migration of the Jewish people. From Spain they went to different parts of Europe, but soon some went to the New World, although they were prohibited from settling there by the Spanish Inquisition and by edicts of the Portuguese government. Many came, especially to the Portuguese dominions in Brazil, often to be burned at the stake. Among these was a Jewish physician, Juan Alvarez, who was burned at Lima, Peru, about 1580. Gradually, however, the Jews won more rights, especially under the Dutch regime in South America, and communities which had been granted all civil rights were established. For example, in the Dutch colony of Surinam, a strong Jewish settlement has persisted from 1664 up to the present day.

However, in 1654, the Dutch lost control of Brazil to the Portuguese who expelled the Jews. In September of that year there arrived at New Amsterdam a barque from Brazil containing twenty-seven Jewish men, women and children, the first to arrive in what is now the United States. There was some difficulty during the first two years of their settlement, but soon most civil rights were granted to them, especially under the British from 1664 on.

From New York and directly from the Old World and from South America, Jews then settled in the various original thirteen colonies.

The earliest Jewish physician in this country on record is Jacob Lumbrozo who came from Lisbon, Portugal, and settled in Maryland in 1656. He became an extensive land owner and enjoyed a lucrative practice. In 1658, it is recorded that he sued someone for "wages for seven months attendance." A few months prior to this he was accused of blasphemy but escaped trial on account of the succession of Richard Cromwell, when a general amnesty was granted to all. He was given letters of citizenship in 1663.

Another early physician was a Dr. Samuel Nunez who arrived in Savannah, Georgia, in 1733 with forty

Jewish immigrants, one year after the founding of the colony by Oglethorpe. Nunez is said to have been a court physician at Lisbon. In Savannah, he gained the admiration of Oglethorpe by his generous ministering to the sick, so that when the trustees in England protested against the presence of Jews in the colony, Oglethorpe called their attention to the good services of Dr. Nunez.

An early historian of medicine in America, James Thacher, writing in 1828, makes mention of a Dr. Siccary, who lived in Virginia about 1750. He says:

> Dr. Siccary, a practitioner of medicine, was, it is believed, a Portuguese Jew. It is said by Mr. Jefferson that we are indebted to him for the introduction of that admirable vegetable, the tomato. He was of the opinion that a person who should eat a sufficient abundance of these apples, would never die. Whether he followed his own prescription is not known; but he certainly attained to a very old age, and particularly for the climate in which he lived.

In this regard a Hebrew poet of the Middle Ages remarked that, "Most physicians you meet reach a ripe old age because the Angel of Death wishes to give them a chance to increase his victims." Certainly many of the physicians to be mentioned here did attain many years.

Two Jewish physicians appear in New York in the roll of the Spanish and Portuguese Congregations as early as 1742, a Dr. Woolin and a Dr. Nunez. The former, a native of Bohemia, advertised as a physician in Zenger's *New York Weekly Journal*, stating that he had served in his "Imperial Majesty's Army as Chirurgeon four years."

At the time of the outbreak of the Revolution, there were some two thousand Jewish persons in the colonies. The number of Jewish physicians was very small. Although numerous Jewish civilians served in the war, only two recorded instances of physicians serving are known. One was a Philip Moses Russell, who served as surgeon's mate, but does not seem to have regularly practiced medicine. He received a letter of commendation from General Washington, "for his assiduous and faithful attentions to the sick and wounded." The other was Moses Bloomfield, an Army Hospital Physician and Surgeon.

The status of medicine in the United States was not very high at this time. Although there were some 3500 physicians in the States in 1790, not more than 400 had received medical degrees. There were only four medical schools in the country at the time, the first having been established in 1765 at Philadelphia. Most of the men with degrees had received them abroad, chiefly from Edinburgh and England.

Thus there were few trained doctors. Also, a certain prejudice existed among the early settlers against both the legal and medical profession. This attitude is expressed in the quaint remark of Gabriel Thomas who in 1690 wrote his "Account of the Provinces of Pennsylvania and West Jersey." He says: "Of lawyers and physicians, I shall say nothing, because this country is very peaceable and healthy. Long may it so continue and never have the occasion for the tongue of the one nor the pen of the other—both equally destructive of men's estates and lives."

It is interesting to note that as early as 1723, the degree of Doctor of Medicine had been conferred by

Yale College upon Daniel Turner. This, however, was preceded by a gift to the college, so that the facetious ones of that day insisted that the M.D. signified Multum Donavit.

But medicine continued to advance in the new United States. From the war of 1812 on, many Americans went to France to study and there came under the influence of the French clinicians of the school of Louis. Others began to go to Germany and Austria. The names of Rush, Bigelow, Physick, McDowell, Mott and Gerhard stand out in the early nineteenth century. Many new medical schools opened. Daniel Drake pioneered into the Middle West and established several schools there. Original clinical work, especially in surgery, was being produced so that by the time of the Civil War, American medicine was firmly established.

But what rôle did the Hebrew physicians play during this time? Little, since there were but few. Although in 1859 there were some 200,000 Jews in the United States, a large number of them had come over after 1815 and another large number after the revolutions of 1848 in Europe. These came mainly from England, Germany and Poland. Many of them settled in the Mid-West and were pioneers in new communities.

A few names recorded in the early nineteenth century may be mentioned. One, a Dr. Isaac Abrahams, a graduate of Columbia College in 1774; another a Dr. Joel Hart, born in 1784 in Philadelphia, who was educated in England and graduated from the Royal College of Surgeons in London. He is mentioned as one of the founders of the Medical Society of the County of New York in 1801, and as one of the incorporators and trustees of the New York College of Physicians and Surgeons in 1807. From 1817 to 1832, he was United States consul at Leith, Scotland, but then resumed his medical practice in New York until his death in 1842.

Another well-known physician of that day is Daniel Levy Maduro Peixotto. He was born in Amsterdam in 1800, was educated in Curaçao and then went to New York where he graduated from Columbia College in 1816 and from the College of Physicians and Surgeons in 1819. He was in the office of Dr. David Hosack for a time. In 1825 he was made Secretary of the Academy of Medicine and was president of the New York Medical Society from 1830 to 1832. He became dean of the faculty of the Willoughby Medical College in Cleveland, Ohio, until his death in 1843. His family has been a most prominent one in public affairs in the United States.

Then came more wars, sometimes of benefit to medicine. A prominent Jewish soldier in the Mexican War was David Camden de Leon who was born in South Carolina in 1813. He graduated as a physician from the University of Pennsylvania in 1836 and two years later entered the United States Army as an assistant surgeon. He served throughout the Mexican War and on two occasions led a charge of cavalry after the commanding officer had been killed or wounded and earned the sobriquet of "The Fighting Doctor." At the outbreak of the Civil War he organized the medical department of the Confederacy and became its first surgeon-general.

Another surgeon-warrior was a man who subsequently did excellent work in several fields. This was Simon Baruch. He was born in Prussia in 1840, came to the United States early and studied at the medical colleges of South Carolina and Virginia, obtaining his diploma in 1862. He immediately entered the Confederate army, serving for three years at the front. His essay on "Bayonet Wounds" attracted much attention at the time. In 1874 he was elected president of the State Medical Association of South Carolina and in 1880 was instrumental in producing state legislation there on vaccination. In 1881, Baruch moved to New York. His principal writings were on malaria, appendicitis, diseases of children and hydrotherapy. His insistence on the need of operation in a case of appendicitis and his subsequent contributions to the diagnosis of appendicitis make him one of the pioneers of this revolution in surgery, equally so with Reginald Fitz of Boston. In 1892 he published his work on "The Uses of Water in Modern Medicine," the first work on the subject in English and a powerful stimulus in directing physicians to the valuable results of hydrotherapy. Even before this, in 1888, he had made a plea for the treatment of typhoid fever by the Brand bath which had been successfully used in Munich. He was also a world pioneer for the establishment of "free public cleansing baths." His well-spent life ended in 1921.

On the Northern side in the Civil War, was another young man famous in American medicine, Jacob da Silva Solis-Cohen. He was born in New York in 1838 but moved to Philadelphia where he studied at both the Jefferson Medical College and at the University of Pennsylvania Medical School, from which latter he graduated in 1860. At the outbreak of the Civil War, he entered the United States Army as a private and was then tendered the position of assistant surgeon and served in the defense of Washington. In 1861 he became acting assistant surgeon in the Navy. In 1864 he was visiting surgeon to the two military hospitals in Philadelphia and is recorded as having performed one of the ninety-four successful ligations of the femoral artery done by army surgeons in that war. He returned to practice in Philadelphia in 1866. Among his first patients was a young girl who had an obscure disease of the throat and he determined to make a study of the then new science of laryngoscopy. In 1867 he published his first work on "Inhalation in the Treatment of Disease" which gave him an international reputation. "Diseases of the Throat and Nasal Passages" published in 1872 put the sciences of laryngology and rhinology upon a firm literary basis. In 1874 he published a monograph of lasting importance entitled "Croup in its Relation to Tracheotomy." In 1867 he performed the first successful operation for laryngeal cancer and for many years the only one. He received various academic appointments. In 1883 he was appointed Honorary Professor of Laryngology at Jefferson Medical College. He was one of the founders of the American Laryngological Association. He wrote many books in his specialty and was active until his death in 1927. He believed that competent physicians must be all round men and while practicing a specialty kept up his general knowledge of medicine by work in outpatient services. His brother, Solomon da Silva Solis-Cohen, born in 1857 has likewise been famous, especially in clinical medicine and therapy.

Another famous Pennsylvanian of an earlier period was Isaac Hays, born in 1796 and graduated from the University of Pennsylvania Medical School in 1820. He was one of the first surgeons to the Pennsylvania Infirmary of Diseases of Eye and Ear, founded in 1822, and was surgeon to the famous Wills Hospital for Eye Diseases. From 1841 until his death in 1879, he was sole editor of the *American Journal of the Medical Sciences*, so that it was frequently spoken of as Hay's Journal. He was a well-known ophthalmologist and contributed a "needle knife" for cataract operations. Howard Kelly describes him as being bland, dignified, and benevolent. An interesting part of his career was accompanying an expedition in 1853 to the Arctic in search of Sir John Franklin, the explorer. After that he led another expedition to the Arctic about which he wrote most entertainingly.

One of the early physicians of Cincinnati, mentioned by the late Dr. Illoway as a "fine old man," was Dr. Abraham Bettmann. He was born in 1806 in Bavaria. He studied Hebrew for a time but suffered a hemorrhage and was advised not to enter the rabbinate or any other profession which would entail a strain on his lungs. However, he lived to the age of ninety-five. He graduated as a Doctor of Medicine in 1837 and then practiced for a time in several small towns in Bavaria. But he encountered difficulties in the free exercise of his civil and professional rights and a few years later went to Cincinnati where he was prominent as a practitioner until his death in 1901.

A much better known physician is Dr. Abraham Jacobi, born in 1830 in Westphalia. He graduated from the medical school at Bonn in 1851 but having engaged in a revolutionary movement in Germany, was imprisoned, but escaped and came to New York. In 1857 he began giving lectures on pediatrics in the College of Physicians and Surgeons; and in 1860 was appointed to the first special chair in pediatrics in this country at the New York Medical College, now defunct, in which he established a pediatric clinic in 1862. From 1870 to 1899 he was Clinical Professor of Pediatrics in the College of Physicians and Surgeons. He was a voluminous contributor to medical literature and to the history of pediatrics. He was twice president of the American Pediatric Association and in 1911 was elected president of the American Medical Association. His long and useful life ended in 1919.

Another well-known immigrant was Louis Elsberg who was born in Prussia in 1836. He came to the United States as a young boy and graduated from the Jefferson Medical College in 1857. He then went abroad and studied laryngology with Czermak. On his return he practiced laryngology in New York City where he opened a nose and throat clinic in 1863 at the Bellevue Hospital. He was professor of laryngology at the New York University Medical School for seventeen years until his death in 1885. He was one of the founders with J. Solis-Cohen of the American Laryngological Association, and was its first president in 1879. He made many excellent contributions to the literature in his field. He was the first in this country to demonstrate in public the use of the laryngoscope in diagnosis and treatment.

Another man famous in a specialty was Aaron Friedenwald, born in Baltimore in 1836. He graduated from the University of Maryland in 1860 and then went to Europe for postgraduate study. He was particularly attracted by Ort and Von Graefe. In Baltimore he practiced general medicine beside the specialty of ophthalmology as did many of that day. From 1873 until his death in 1902 he was professor of diseases of the eye and ear in the College of Physicians and Surgeons of Baltimore and continued to hold a high position in the profession of Maryland. In 1890 he called into existence the present Association of American Medical Colleges which has played so important a part in raising the standard of medical teaching in this country. He was deeply interested in the history of Jewish physicians.

Many other men might be mentioned who began to achieve prominence toward the close of the nineteenth and the beginning of the twentieth centuries. These, however, can better be estimated at some future time. It is noteworthy that most of the well-known men of Jewish faith in the United States in the nineteenth century were specialists in diseases of the ear, eye, nose and throat and that all were really eminent in their field. Of course in Europe during the nineteenth century, Jewish physicians came to the fore in many fields. Among them may be mentioned: Henle, Remak, Cohnheim, Romberg, Weigert, Traube, Kaposi, Metchnikoff.

The number of Jews in the United States was not so large before the need for and the desire to establish a Jewish hospital arose. The earliest one was "The Jews' Hospital" founded in New York in 1852. The name was changed to the Mount Sinai Hospital in 1866. In Philadelphia a Jewish hospital was founded in 1864 and a Jewish Maternity Association in 1873. As early as 1866, the cornerstone for the "Asylum for Israelites" was laid in Baltimore. The first Jewish Hospital in Chicago was established in 1868. It was destroyed in 1871 through the intervention of Mrs. O'Leary's cow. However, a few years later the Michael Reese Hospital was begun.

Although this survey might properly end here, I should like to speak of two men of somewhat more recent times who seem to me to link the old and the new. One is a Dr. Henry Illoway, whom I had the pleasure of meeting about a year before his recent death. He was born in 1848 in Bohemia. When I met him he was eighty-two years old. I found him in an office jammed almost solid with books of different vintage and many ancient looking medical instruments. He was dressed in a large dark blue great-coat and a blue peaked cap which together with a white goatee and mustache made him look not unlike an old sea captain. A thin high-pitched voice told me of life in Cincinnati in the old days. He had graduated from Miami Medical College in 1869 which was then a well-established school in Cincinnati. He practiced there and was Professor of Diseases of Children for many years in the Cincinnati College of Medicine and Surgery. He was the author of books on gastroenterology and on pediatrics. In 1894 he migrated to New York. At my meeting with him I noticed that he continued to have office visits by patients. He said that he did not see why young men studied medicine nowadays since the rôle of family advisor was gone and money rewards were few.

The other man is nearer our times, well-known and yet deserving of more renown. This is Joseph Goldberger, styled "The Adventurous Goldberger" by one of his colleagues. He was born in Hungary in 1874 on a peasant farm and came to America in 1881. He studied civil engineering when sixteen at New York City College. In 1892 he chanced to attend the Harvey lecture given by Austin Flint, Jr., at Bellevue Medical School. He immediately transferred his interests to medicine and entered the Bellevue Medical School. He graduated in 1895 and then interned at Bellevue Hospital where his case histories were held up as models of perfection. He was in private practice for two years but desired to follow the open road and in 1899 he entered the Public Health Service. For years he was engrossed in yellow fever in Mexico, Porto Rico and the Southern States. When the 1905 epidemic in New Orleans ended the story of yellow fever in the United States, Goldberger dropped the subject and took up the study of parasitic worms. He worked at the Hygienic Laboratory then with Stiles, W. Welch and M. Rosenau. In 1909 he was called to Philadelphia to investigate the cause of a sudden epidemic of a strange disease known as Schamberg's disease since 1901. The cause of the disease had remained a mystery. Within forty-eight hours after his arrival in Philadelphia, he had worked out the whole process of the epidemiology and held up the acarine mite of wheat fields and wheat straw mattresses as the cause of what has since been called "straw itch." Later in the same year he worked with H. Ricketts during the typhus epidemic in Mexico. He did much work on Rocky Mountain spotted fever at that time. In 1910 he nearly died of typhus by which Ricketts shortly thereafter was killed. In 1914 he began his great pellagra adventure throughout the South. His work in this was painstaking and absolutely thorough and established the cause and treatment of this disease on a certain foundation. Goldberger has been described as a man of paradoxes. Outwardly he was cold as steel but his intimates found him full of emotion, boyish enthusiasm, idealism, strongly adventurous and having a high intellect. Medicine lost a keen thinker in him in 1929. These men were all pioneers—quite new to the country and yet boldly striking out into the limitless realms of Aesculapius. They were few. They accomplished much.

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ROBERT KOCH

(1843–1910)

AN AMERICAN TRIBUTE

PART II*

By LAWRASON BROWN, M.D.

SARANAC LAKE, N. Y.

THE COMPLETED WORK ON THE TUBERCLE BACILLUS

Two years after the discovery of the tubercle bacillus (1884) in the second and last volume of the "Communications,"† appeared a more extended article of eighty-eight pages, illustrated by fifty-three excellent chromolithographs portraying the bacillus, its cultures, and pathological sections and specimens from man and animals. It is this article and not the briefer paper of 1882 from which we must judge Koch's work. Some statements in the first paper were toned down and the experimental evidence extended. Much work on tuberculosis had been done in the meantime and here and there he mentions it, as for example, the improvements in staining the bacillus due to Ehrlich, Ziehl and others which he recommends. He also mentions later that Tyndall had first used coagulated blood serum as a medium for growing germs. In this paper he apparently modifies the view expressed in his first, viz.: "*Perlsucht* (cattle tuberculosis) is identical with tuberculosis in man and is therefore a disease transmissible to man."

The nature of the disease when he began his work, Koch states in his second article, was still in doubt and clinical observation could not even prove its contagiousness. Pathology suggested its infectiousness (see the work of Buhl, Ponfick, Weigert) but was concerned only with the spread in a single body. The work of Klencke, of Villemin, of Klebs, and particularly of Cohnheim and Salomonson, by the introduction of infective material into the anterior chamber of the eye of the rabbit, proved its infectiousness, and that the disease was due to some contagium but afforded little information concerning it. Is the contagium, composed of formed elements neither belonging to the constituents of the body nor springing from it, found in the diseased parts? Is the contagium, granted it be found, organized and capable of movement, growth, increase and reproduction? Further what are the relations of such contagium to the surrounding tissue, is it always present in all forms of the disease? To do this it is of course necessary to isolate the contagium, then to reproduce the disease in a healthy organism. The first problem was to discover such an organism when all others had failed to do so. Koch examined sections of grey tubercles hardened in alcohol, and also crushed fresh tubercles but all unsuccessfully. Recalling that Weigert had shown that bacteria are best seen when stained with stains weakly alkaline, he added caustic potash to methylene blue and immersed cover glass preparations in it for twenty-four hours. He saw, after decolorizing them, for the first time very fine rod-like forms. To demonstrate them in sections it was necessary to counter-stain with vesuvin, which decolorized the tissue and stained it brown but failed to change the blue color of the bacillus. Heating hastened the staining (Rindfleisch) and Erhlich's method of using fuchsin and aniline water, as well as his method of decolorizing with acid he accepted as an improvement over his first method. Erhlich announced his improvement in staining the bacillus almost over night and it is probably true that obtaining a culture of the tubercle bacillus from Koch he did stain it on the night of March 24, 1882, with a stain he had already devised for *Mastzellen*. In sputum, only the yellowish particles are to be studied, spread on a cover glass, dried, fixed with heat and then stained. He later used alcohol also for decolorization. He gives specific directions for all this in a summary and emphasizes the value of the Abbe condenser and the Stevenson 1/12-inch oil immersion lens. Horny tissue, hair and epidermis may retain some of the blue color but are of little significance. No other organisms save the leprosy bacillus stain in this way but Koch had no doubt that others would be found. The replacement of aniline water by carbolic acid, suggested by Ziehl, he accepts as theoretically better.

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† Afterwards they were called "Arbeiten."

* Part I appeared in the March, 1935, issue of the ANNALS OF MEDICAL HISTORY, p. 99.

The close adhesion to each other of bacilli in cultures points, he thinks, to the existence of an enveloping cementing substance. The size of the bacillus he noted by comparing it to a red blood corpuscle; the bacilli are often slightly bent.

He next wished to determine if these bacilli were present uniformly in cases of tuberculosis. They may be many or few, in the cells or between them but the cheesy substance contains few as a rule, due to the fact that they either die or lose their staining properties. Wandering blood cells carry the bacilli here and there in the body from the tuberculous focus. They may travel far but sooner or later the injurious influence of the bacilli so affects the cells that they lose all power of motion and disintegrate, while other cells take up the bacillary load or change into epithelioid cells and later into giant cells with numerous nuclei. Over and over he refers to the spores of the tubercle bacilli, and while many question them, some hold they may indeed be modified spores. After some histological descriptions he turns to the study of the occurrence of tubercle bacilli in the various lesions of man.

In every one of the nineteen cases of miliary tuberculosis, tubercle bacilli were found in the tubercles, in some organs only in giant cells, in others between the cells. In all save one case old caseous masses were found, chiefly in the bronchial glands or lungs. From a study of one tuberculous kidney he concluded that tubercle bacilli can escape into the urine and thinks the term mixed infection, used by Brieger and Ehrlich in connection with typhoid fever, might be applied to tuberculosis. Three ways are mentioned by which miliary tuberculosis occurs, growth into the vein, probably the commonest (Weigert); into the thoracic duct (Ponfick), and into the artery, which Koch himself describes.

Tubercle bacilli were found in all of the twenty-nine cases of pulmonary tuberculosis examined, more abundant in recent caseous infiltration or in the softened walls of cavities, more sparingly in cavities with firm walls and fewest in cicatricial, contracting and much pigmented lung tissue. He describes in detail what occurs when a few bacilli gain a foothold in the lung and how the disease develops and spreads through the blood vessels, lymphatics, and bronchi. In this way the larynx and intestines are involved by direct contact. Caseous pneumonia is due to large numbers of infecting tubercle bacilli. These bacilli are wanting in the sputum of other diseases but are nearly always present in pulmonary tuberculosis, in fact up to that time he had always found them. In cavities he again speaks of secondary organisms.

In intestinal lesions, he thinks the bacilli may grow more abundantly than in the lung, and since Gaffky found no bacilli in the feces in some cases with bacilli in the sputum, and always in the feces in cases with intestinal tuberculosis, he concluded that Lichtheim was correct when he said that such bacilli in the stools meant intestinal tuberculosis, a conclusion which Bodo in 1891 showed to be erroneous.

Pus from a kidney and from a spine in which no tubercle bacilli were found infected animals. In scrofulous glands, in tuberculosis of the joints, in lupus, he demonstrated tubercle bacilli.

He next turned to the lesions in animals and stated that no warm-blooded animal existed that was totally insusceptible to tuberculosis. He studied the tuberculous tissues from cattle, horses, swine, sheep, goats, fowls, monkeys with the same results.

Spontaneous tuberculosis was never present in any animal on entry into the laboratory but such animals when kept in the same room with tuberculous animals for three or four months did in some instances develop the disease, and in such a manner that it suggested infection by inhalation. This was more common after eight to ten months' exposure. He autopsied seventeen such guinea pigs and rabbits. Following this he describes the differences between the lesions in these two animals, and notes the variations following the various manners of infection, subcutaneous, intra-abdominal or intravenous. He writes:

> From these three facts, that tubercle bacilli are always present in tuberculosis and occur nowhere else, that they precede both as to place and to time all the peculiar pathological changes, that their number, appearance and disappearance are in direct relation with the course of the disease—the conclusion may be drawn with great probability that the tubercle bacillus is not a chance accompaniment of tuberculosis but stands in the position of the direct cause of the disease.

To remove this uncertainty, to make assurance doubly sure, it was necessary to isolate the tubercle bacillus, to cultivate it, and finally to reproduce tuberculosis by the introduction of the bacilli free from all admixture with the products of disease.

Koch expected to have some difficulty in cultivating the tubercle bacillus. He used his solid gelatine culture medium, and kept it at room temperature but failed. He then thought it wise to use some medium as similar to the body as possible and the solidified blood serum media of Tyndall occurred to him. Substances containing bacilli were spread over the surface of this medium and kept at a temperature of 37°c. He gives the most detailed directions for all the steps.

The bacilli never penetrated nor liquefied the serum, remained loosely upon the surface, and had apparently no power of locomotion. Cultures from miliary tubercles, from the content of a cavity, from lupus or from perlsucht (bovine tuberculosis), behaved exactly the same for as long a time as sixteen to eighteen months. In time he cultivated the germ on and later in, shallow layers of fluid media. He could never grow them on potato, or above 42°c. or below 30°c. He concluded that the bacillus never grew in nature or reproduced itself outside the body of an animal and was in fact an obligatory parasite.

Having grown pure cultures of the tubercle bacillus for many generations (70) outside the body, he proceeded to attempt to reproduce the disease experimentally. Three errors must be avoided: (1) spontaneous tuberculosis; (2) the use as infecting agents of material which closely resembles tuberculous disease but is not; and (3) the use of contaminated instruments. To avoid spontaneous infection it is well never to keep the animals any length of time in the same place with tuberculous animals for they are unlikely to remain free of infection longer than eight to ten months. When the disease fails to spread to a distance from the site of inoculation, to lymphatic glands, lungs, liver, spleen, there is a strong a priori reason to believe that we are not dealing with true tuberculosis. In regard to all instruments, before use they must be sterilized. It is difficult for us today to grasp how necessary it was for Koch to write in this detailed way.

In his inoculation experiments he made sure that the specimen contained tubercle bacilli and for this reason he had almost uniformly successful results. Forming a little pocket under the skin he introduced the bit of tissue. The next day the slight wound was glued together. In two weeks the adjoining lymphatic glands swelled and the usual train of symptoms followed. He detected no difference with the material he used, all types of tissue from all types of lesions in man, in cattle, and in other forms of animal tuberculosis. Such was the proof he adduced to show that tuberculosis was an infectious disease. But were the tubercle bacilli the only cause of tuberculosis? Further work under stringent conditions with subcultures was necessary to prove this, and the animals were killed as quickly as possible for the experiment. As a control sterilized blood serum was injected without any trace of tuberculosis ever developing. The inoculations were all made subcutaneously, and the only difference from those performed with tuberculous tissue was that the course of the disease was quicker. In both, inoculation of the eye showed the formation of tubercles, the number depending directly upon the number of bacilli injected. The same thing was found to be true following intraperitoneal injection, which is more easily performed in guinea pigs than in rabbits. One dog infected in this manner apparently recovered, the only one Koch ever saw, but died after subsequent reinjection, showing that it was not immune. The intravenous method is the most certain, and is followed by much more extensive tuberculosis than ever follows spontaneous infection. Inhalation infection resembles spontaneous, upholding his contention that in spontaneous infection the portal of entry is by inhalation.

In all Koch used 94 guinea pigs, 70 rabbits, 44 field mice, and all became infected, while the controls treated with indifferent fluids remained without exception free from tuberculosis.

In this paper he clearly formulated the conditions, first suggested in part by Henle, that must be fulfilled before it can be said that any germ is the cause of a disease. They are: (1) The organism, germ, should always be found microscopically in the bodies of animals having the disease and in that disease only; it should occur in such numbers, and be distributed in such a manner as to explain the lesions of the disease; (2) the germ should be obtained from the diseased animal and grown outside the body; (3) the inoculation of these germs, in pure cultures, freed by successive transplantations from the smallest particle of matter taken from the original animal, should produce the same disease in a susceptible animal; (4) the germs should be found in the diseased areas so produced in the animal.

In his article Koch then proceeds to discuss the relation of the bacillus to the etiology of tuberculosis. In the first place the germ cannot grow outside the body of an animal for it requires a constant temperature of at least 30°C. (86°F.). No facts support the view advanced by some that the tubercle bacillus can assume other forms outside the body, nor is there any evidence as yet that after two years the bacillus loses any of its virulence. Later he modified this view. No doubt the tubercle bacilli did originate from another species of bacteria but now they appear stable. So all tuberculosis comes from preexisting tuberculosis, and the most common forms are phthisis and tuberculosis of domestic animals. He mentions the danger of sputum in fine particles, and dried sputum in the form of dust which he thinks is more important. Handkerchiefs are especially dangerous. He notes how long the tubercle bacillus is in developing and thinks this the reason why so many escape infection for the bronchial cilia sweep out the bacilli before they can develop unless, as in measles, the respiratory tract is denuded for a time of its protecting epithelium, or a secretion is produced difficult to dislodge and suitable as a nidus for the tubercle bacillus. Adhesions of the lungs may bring about a similar condition. So not only the bacillus but some favoring condition is necessary for infection in man. He fails to mention the tonsils as a portal of entry in tuberculous cervical adenitis.

The danger from bovines is concerned chiefly with milk and meat; but he does not stress the danger and thinks the only dangerous cow is the one with a tuberculous udder. He doubts whether a single case in the human subject will ever be referred unquestionably to the partaking of the flesh or the milk of tuberculous animals. However, from a hygienic point of view, the same precautions must be taken against infection with the bovine tubercle bacillus as against the human type.

There is, he notes, a striking difference between tuberculosis in children and in adults, and apparently a predisposition to infection in some families, due in some instances no doubt to increased opportunities for infection. A tendency to catarrhal infections of the respiratory organs or poor development of the thorax might explain a predisposition in some but others cannot be accounted for. From a study of autopsies it is found that tuberculous foci may reach a fair size, then contract, cicatrize and heal. He interprets this as indicating that what was at first invasion a favorable soil, later becomes changed into a bad soil which prevents growth and so favors healing. What brings this about he leaves to the future to determine. He notes how rare is uterine infection and explains that what may be inherited is not the germ but a soil favorable to its growth. Koch modestly wrote:

> The discovery of the tubercle bacillus merely proves the correctness of the contention of Cohnheim that tuberculosis is an infectious disease, which has until now been doubted by the majority of physicians. The addition of this conclusive proof is, I believe, a great gain. It furnishes us also with a new diagnostic sign. In the future the diagnosis in doubtful cases will be determined by the presence of the tubercle bacillus in the lesions. To a large extent it does so today and the success of this method well supports my belief in the etiological role of the bacillus. Lastly we may earnestly hope that the discovery will aid us in the treatment of the disease. As far as our observations go, we can expect little, if anything, from the actions of chemical agents upon the bacilli in the living body, and we must turn our main efforts to prophylaxis. This means, on the one hand, effective disinfection of tuberculous material and, on the other hand, the protection of healthy individuals from contact with the bacilli.
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> It seems to me none too early to insist on active prophylactic measures against tuberculosis. But considering the enormous extent of the disease we must, in all steps which we undertake to combat it, reckon with social conditions, and consider just how far we may proceed in the right direction, if interference and various disturbances and disadvantages are not to curtail the benefit.

So ends a masterpiece of medical literature. One of the most remarkable things in medical history is how little of moment has been added to our knowledge of the tubercle bacillus since the appearance of this contribution.

With the publication of this paper Koch reached the pinnacle of his fame. Indeed, some think the discovery of the tubercle bacillus was Koch's greatest achievement.* However that may be, until this time he was known only to scientists as a great scientist for he had so far attracted little attention from the world in general. His discovery of the tubercle bacillus, the cause of so much sickness and suffering throughout the world, made his name a household word.

The effect of this masterpiece upon experimentation, upon the prevention, the diagnosis and the treatment of tuberculosis, was far-reaching. Those who had held that pulmonary tuberculosis was entirely an hereditary disease faded into the background and sanitarians the world over began laying plans to prevent a disease which caused at least one-seventh of all the deaths and one-third of those at a time when man's efficiency was usually at its greatest. Half-hearted measures, frequently combatted by those who held the disease was not contagious, now gave place to those based on a sound, solid foundation. But how the disease spread from man to man and from animal to man was quickly inferred by everyone but still not definitely settled. However, here was the foundation stone which none might cast aside and upon which our present prophylactic (preventive) measures were to be based though details must come later. Indeed upon and around tuberculosis has been built the great voluntary public health movement in America.

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* A translation of this article has been published by the Sydenham Society, London, 1886. Those interested in more details of this fascinating subject should read Allen Krause's delightful articles in the *Journal of the Outdoor Life*, March, April, May and June, 1918.

In animal experimentation the flood gates were again opened for here were laid bare unsolved problems that even the most stupid could easily perceive. If the bacillus could be killed the animal or patient would no doubt quickly recover. In the 1880's and 90's only the difficulty of growing the germ limited the experimental work. Koch's advice that chemotherapy would offer little aid was cast aside and every conceivable substance that might be supposed to affect the bacterium was given by mouth, by injection, and by inhalation. Hydrofluoric acid was inhaled until all the windowpanes and the mirrors were etched and ruined, and still the tubercle bacillus pursued the even tenor of its way in lung and other tissue. But in man they had reckoned without the host, and they sadly discovered that the bacillus was more resistant than man.

In the 1880's, following von Behring's discovery of antitoxin for diphtheria, innumerable attempts were made to find an antitoxin for tuberculosis but all without success. To mention even by name all experimental attempts at treatment would be never ending, and it is only necessary to recall that no drug, no serum, no substance of any sort that is given by mouth or injected in any way will apparently ever be accepted as a cure until it has been first tried on animals previously inoculated with Koch's bacillus, as they call it in France.

CHOLERA AND EGYPT

Cholera, long a scourge of Europe, came from India by way of Egypt or of Afghanistan. It even made its way to America and not only invaded the seaboard cities but ascended the Mississippi and Ohio rivers as well as the St. Lawrence.

When in 1883 it had again reached Egypt both France and Germany sent commissions there to study the disease. While the French commission were first on the ground, Koch, who headed the German commission, had previously found a comma bacillus in a specimen of the intestine of a cholera patient, sent to him from India. Holding themselves at first aloof from one another, later the members of the two commissions became friendly and the Germans were disturbed when they learned that the French were packing up preparatory to returning home. "Have they found the germ?" Gaffky in some trepidation asked Koch. The two, however, decided to ask frankly Roux and Thuilliers for permission to examine their specimens. This was granted, and late that night Koch realized that the French had confused blood platelets, found normally, of course, in the blood, for pathogenic microorganisms. The next day Roux, with drawn and white face, came to tell them that Thuilliers had an acute and probably a fatal case of cholera. Would Koch come to see him? Koch went and found the poor fellow with sunken eyes, lying in extremis. Looking eagerly at Koch he asked in a greatly weakened voice, "Is . . it . . . the . . . cholera . . . Germ?" Koch glanced at Roux and then said to the expiring fellow worker, "Yes. You have found it." "Thank you," he whispered, and again a little later, "Thanks." And then with pleasure in his eyes he quivered slightly and a few moments later Roux closed his fellow worker's eyes. At the funeral which was attended by the German Commission Koch placed two wreaths upon his coffin saying, "They are simple but they are of laurel, such as are given to the brave."

Koch's work in Egypt and India assured him of the truth of his assertion that his cholera vibrio was the cause of the disease, now fully accepted but at the time questioned.

Many, however, doubted Koch's findings, and Pettenkofer went so far as to swallow a whole culture tube of virulent cholera organisms without any apparent discomfort. In several other instances workers thus infected died, and it is related of one who sided with Pettenkofer and essayed to follow his example, that, feeling upset, he took ninety-nine of the hundred known cures for the disease. On his return from this successful expedition, in 1884, Koch was welcomed in a manner seldom accorded to princes and given 100,000 marks from a grateful nation, for he had conquered cholera and pandemics of this disease were no longer known.

UNIVERSITY APPOINTMENT AND TEACHING

Many scientific workers in America who long had recognized Koch's great ability sought to have an opportunity to work under him. Among them was Welch, but Koch advised him to wait for a few months until the spring when Koch expected to receive his appointment as Professor of Hygiene and give his first course on bacteriology. Welch did so, and found the course most inspiring. This was the only course that Koch ever gave save for some brief repeated demonstrations on the diagnosis, detection and recognition of the cholera bacillus which he thought it wise to detect on the borders of Germany. Koch deemed it unwise to bring into any country a germ like the cholera bacillus, and while he himself had almost to smuggle in a culture from Toulouse for his courses, he spoke so strongly upon the subject and fixed his eyes so definitely upon him that Welch poured corrosive sublimate into the culture he had planned to bring back to America with him and consigned it to the Spree. Among others who worked under Koch were Prudden of New York, who taught Trudeau how to stain the tubercle bacillus, and Ernst of Harvard, while Victor Vaughan, Novy, Biggs, Walter Reed, Ford, Shakespeare, Rivas and others studied in the institute of which Koch was head. That Koch had some humor an anecdote related by Rivas shows. He asked Koch how long to flame a slide when staining the tubercle bacillus, and Koch replied, no doubt with a twinkle in his eye, "as long as it takes to say, 'Robert Koch is a great man!'" Rivas was told that no one in the Institute save Koch worked or was permitted to work on tuberculosis.

After refusing a call to a professorship in Leipzig in 1885, Koch became the head of the New Hygienic Institute and a professor of hygiene in the university. Here Petri (culture dish), Pfeiffer (influenza germ), Hesse (agar), Behring, Kitasato, among others from all over the world, worked under Koch who apparently was tireless.

THE DISCOVERY OF TUBERCULIN

Lecturing bored Koch but he was ever present at the many conferences of his associates and a stimulation to all the workers. At this time Koch was in the middle forties, stood above middle size, slender, symmetrically built, with dark brown hair, and a full beard, wearing gold spectacles always on account of his near-sightedness, with a countenance remarkable for the depth of expression and strength of contour. In speaking he was clear and to the point, which he demanded from those with whom he had to do. To strangers he was reticent, particularly unneighborly if he thought curiosity led them to him. He was just the opposite with his associates, always ready to listen, to advise and to help. He was agreeable, affable but not sympathetic. He began early in the morning to work which lasted until the late afternoon or evening. In spite of this he liked to "visit" over the wine and beer (kneipen), particularly with his friends, his associates and their wives. On these occasions and on the evenings devoted to conferences, which he held regularly, he astounded his companions by his remarkable memory and delighted them by recounting his many experiences. The work connected with teaching, for it was thought that the students of the university as well as the graduate students should have the privilege of coming into contact with him, he considered a burden. He read some of his important communications over with his assistants and weekly made "rounds" to discuss the problems he had set many to work upon. All problems of hygiene were studied and the Berlin water supply watched. With Flügge he started the *Journal of Hygiene.* To Welch he talked much of coming to America.

Koch was a true German. In July (15) 1886 we find him planning a tramp through Switzerland and inviting to go with him as a guest a friend, hoping in this way to repay in part his indebtedness to him.

In March (11) 1887 he wrote:

> Frau F. and you have been so kind to send us your congratulations for the engagement of our daughter. We thank you most kindly. My emotions are, as you may imagine, not only of the cheerful kind. For the time being we shall not be separated completely from our child, and that is a comfort but in a few years the young couple will have to leave Berlin and our happy lives together will cease. But this is the lot of parents, to be left alone when they are old and they have to be contented knowing their children are happy.

In 1888 his daughter married Dr. Edward Pfuhl and about this time a certain coolness sprang up between Koch and his wife.

In September 24, 1888 he wrote: "I myself am up to ears in work and for this reason also lost my vacation trip this year which I badly needed to get rid of a stomach catarrh which has been bothering me several months and has worn me out considerably."

Koch was obliged to spend much time with the general staff devising plans in case of war, which no doubt bored him. On one occasion, rumor has it, the Kaiser ordered him to Paris in his general's uniform.

In 1889 and 1890 Koch apparently changed his scientific habits. Formerly most agreeable, he became suspicious and secretive and his assistants saw little of him. When he was able to work along scientific lines, in order not to be disturbed, he worked behind closed doors and only his closest intimates knew what he was doing. You will recall that he had worked upon chemotherapy, and concluded that the problem offered little chance of success. It is well recognized in medical science that carefully recorded, accurate observations make any communication of value, though the explanation offered may be quickly cast aside. This was apparently true of what today we call the Koch phenomenon. When tubercle bacilli are injected into or just under the skin of a tuberculous guinea pig, little is seen until the tenth or thirteenth day following, when gradually an ulcer forms which persists until the death of the animal. Now Koch noted, if he re-injected a tuberculous guinea pig, there occurred a more rapid, a more violent reaction at the site of injection, followed by the formation of an ulcer which as a rule healed quickly and permanently (the Koch phenomenon). From this Koch inferred that there was in the tubercle bacillus some substance not only of value in the diagnosis of the disease but also as a specific in its treatment. In this way he was led to the discovery of tuberculin.

At the International Congress of Medicine, held in Berlin in 1890, in an address on "Bacteriological Investigations," he announced the discovery of a substance which in the test tube or in the animal body hindered the growth of the tubercle bacillus so that guinea pigs given this substance failed to become infected after inoculation, and such as were in an advanced stage of the disease had the disease arrested and all without harm to the animal. In the autumn he published "Further Communications Concerning a Cure for Tuberculosis." In this he gives no details as to the preparation of the remedy, states that his work is not yet concluded, that it must be given subcutaneously, preferably in the interscapular region, that man can stand only a minute fraction of the dose that can be given a guinea pig, describes the diagnostic dose and reaction, the therapeutic dose, its effect upon lungs, lymph glands, bones and joints and finally upon phthisis. It does not affect the bacilli but does kill the living tuberculous tissue and the dead tissue should be removed surgically when possible. In the initial stage of phthisis the patients are always in four to six weeks so freed from all symptoms that they could be considered cured. Incipient phthisis can be assumed to be cured with certainty. In far advanced cases with large cavities it may help but little. Surgical measures similar to the operation for empyema may assist in pulmonary tuberculosis. All this emphasizes the importance of early diagnosis. The treatment is best carried out in a sanatorium. The statistics he leaves to the physicians who assisted him. Koch apparently described the composition of the remedy which had come to be known as Koch's Lymph the following January but only when it became apparent that others would soon do so, and adopted the name suggested by Pohl Pincus in 1884 and resurrected by Bujwid in 1891, "tuberculin."

The world stood aghast and delighted. Trudeau wrote:

> No medical discovery, has ever produced such a sensation as the startling announcement coming from the great scientist who had discovered the tubercle

bacillus. Medical men from all over the civilized world flocked to Berlin to witness the effect of the remedy and to obtain some for their use if possible. A thousand dollars were freely offered for a bottle of tuberculin which contained about a teaspoonful, and the substance could not be procured at that price from those who had been fortunate enough to procure some. Crowds paraded the streets in Berlin chanting hymns in Koch's honor and shouting his name.

A group of patients had drawn their steamer chairs into the sun on the edge of the porch of the Ampersand Hotel on one of those rare days of August in the year 1890. The air was crisp. Below them lay the Lower Saranac Lake, reflecting and blending with the deep blue of the sky while the tiny islands dotted here and there recalled the Indian meaning of Saranac, "Lake of the Clustered Stars." A mile away lay the small village of Saranac Lake, and on the opposite side of a large hill Dr. Trudeau had begun his Sanatorium. The good Doctor had warned many of them to keep very quiet; a few were permitted to troll for trout, going as far as the Upper Lake. As usual their conversation that morning turned on fishing and the approaching deer season, but ever and anon drifted, as all conversations among such groups do, to their disease, whether they would lose their coughs, whether they too had a cavity, which state to them spelled doom. A patient who had already spent several years in the Adirondacks, was discoursing upon the Doctor's prowess with rifle and gun, and had begun upon his third story when the mail was announced. In such resorts as this, where many are separated for long periods from family and friends, this is usually the main event of the day. The railway had been completed to Saranac Lake village that very spring and the papers were only one day late. Before long they had again resumed their comfortable sunny places, and then suddenly a shout went up—a cable announcing the discovery of a cure for tuberculosis appeared on the front page of yesterday's paper. The patient of several years' standing, to whom many of them turned, shook his head slowly. "I have heard of many cures," he said, "but none of them has ever helped." Turning to another he continued: "You remember the masks we all wore, saturated with creosote or other bad smelling things. Then there was the steel cabinet in which they placed a fellow and pumped out the air. But this," he paused, "seems to me to be different. And what impresses me most is that it comes from that fellow in Germany who discovered the TB germ. Here comes the Doctor, let's ask him about it." Dr. Trudeau eagerly read the dispatch. "I know nothing more of this than you do," he said. "But Koch is a great scientist and would not announce that he has a cure if he were not sure of it. We must wait for further information." Dr. Trudeau himself had been working along such lines and had only partially succeeded in protecting guinea pigs against tuberculosis. His natural feeling of disappointment was quickly replaced by one of joyous enthusiasm and praise for the man who had done what he had failed to accomplish.

Day by day the papers were feverishly read and discussed. Then came the news that Biggs and Loomis of New York had sailed to learn how to administer the new treatment. The patients could stand it no longer.

Many who were very sick packed their trunks and left for New York, hoping by doing this to be nearer the docks and to save some of the few precious days that remained to them.

And then finally came the sad realization of the truth. Overdosage and disastrous reactions occurred, followed apparently in a few far advanced cases by death. Virchow said it spread the disease, but this was doubtful. Great resentment arose and much abuse was heaped on Koch who through it all remained silent and at work. In November, 1890, you may recall Trudeau published the failure of his attempts to immunize guinea pigs and rabbits by the injections of filtered and sterilized liquid cultures, really unconcentrated tuberculin. In 1892 Kitasato, under Koch's direction, published details of experiments upon guinea pigs which revealed that Koch had obtained only partial immunization which Trudeau and others had recorded at the same time. It was rumored that high authorities (even Emperor William, some whispered) had forced Koch to make a premature announcement, but again and again he writes of new tuberculins, and in April, 1897 describes "T.R.," tuberculin residuum, capable of protecting guinea pigs against subsequent virulent inoculations and of producing attempts at the formation of scar tissue, provided the treatment be begun within a short time of infection (two weeks), stating that "anything better of that kind cannot be made, and whatever is to be gained by tubercle cultures must be obtained by means of this preparation."

Again, as Trudeau points out, he fails to bring evidence of his claims. "I succeeded," Koch wrote, "in rendering a large number of guinea pigs completely immune, so that they submitted to repeated inoculations with various cultures without being infected." It is difficult for us now to see how Koch could have been so misled but he gives no protocols to uphold such assertions.

Koch's great eagerness to make practical use of his discoveries played a prominent part in all of his work. During the earlier years it was of immense benefit, but later in his life it tended to lead him astray, possibly to entice him to draw conclusions based on insufficient evidence. This unfortunate eagerness, so little manifested in the earlier years of his life, have led some to state that with the publication of his article on the discovery of the tubercle bacillus he reached the height of his career. They are probably correct.

In 1901 in his papers on the "Agglutination of Tubercle Bacilli and the Application of this Agglutination," Koch called attention to the agglutination of certain bacteria by the sera of patients who had been infected by such bacteria, pointing out that Arloing and Courmont had attempted to render the procedure useful in tuberculosis, but that many including himself (Koch) had found it of little value. Koch then set to work to find a better method and suggested grinding very fine the tubercle bacilli and then making a very weak suspension (1:10,000) in water, so weak that opalescence is hardly visible. Different dilutions of serum produce agglutination if it comes from a tuberculous animal. It is needless to go further into details but the results of this study led Koch to discard the T.R. tuberculin, about which he said nothing better in tuberculin could be expected, for a new preparation which increased agglutination. This new tuberculin, known as B.E., bacillary emulsion, is what its name suggests, an emulsion of pulverized tubercle bacilli in 50 per cent glycerine, so made that 1 c.c. contains 5 mg. of the pulverized tubercle bacilli. It is best administered, he said, intravenously, and most of his cases were in the second or third stage of pulmonary tuberculosis, but early cases did best. This treatment went hand in hand with other forms of treatment but at the beginning it is wise to have the patient under close observation in a hospital. All the tubercle bacilli in this preparation were not pulverized and a few remained alive but apparently did no harm. He alone makes no mistakes who takes no new steps. Possibly we expect too much from great men.

THE TUBERCULIN REACTION

Now Koch had also called attention to the fact that if a very small quantity of tuberculin, 0.001 c.c., 2/20,000 of a teaspoonful were injected under their skin, many patients with tuberculosis would have, within eight to twenty-four hours, a feeling as if they had grippe, run an elevated temperature for a few hours and show some reaction at the site of their disease. A healthy man, like himself, Koch said, would not react in this way even when ten times this dose was injected. This subcutaneous tuberculin reaction was extensively employed but some observers criticized it as dangerous, and many gave it up on this account though in Saranac Lake we met with few if any untoward permanent results, and we continued its use under certain conditions. Virchow, you may recall, stated the injections of tuberculin under the skin mobilized the tubercle bacilli and thus caused a spread of the disease, which we could not demonstrate on animals.

Recognizing that Koch's interest lay chiefly in infectious diseases, the Institute for Infectious Diseases was organized in 1891 and Koch, giving up his academic work, was placed at the head. Here Koch again had patients under his charge and he gave to them the same excellent care he employed in his early days in Wollstein. Cholera visited Germany again in 1892 and the Institute, later known as the Koch Institute, devoted itself to work along this line. In 1889 Kitasato discovered the tetanus bacillus, and Behring in 1890 the antitoxin for diphtheria and tetanus, while working with Koch.

[*To Be Concluded*]

BOOK REVIEWS

An Essay on the External Use of Water. By Tobias Smollett. Edited, with Introduction and Notes, by Claude E. Jones. (Repr. from *Bulletin of the Institute of the History of Medicine*, 3: No. 1, Jan., 1935.) Balt., Johns Hopkins Press, 1935.

Although most readers of Smollett's novels know that he was a physician and are familiar with the frequent reference to medical matters in his pages, we doubt if many have read the essay which is here reprinted in such a pleasing form. From the scientific point of view it is to be doubted whether the Essay is of sufficient value to be worthy of reproduction, although it gives a good idea of what were the prevalent views of the value of the Bath Waters and the methods of using them, besides dwelling on the use of ordinary water in various surgical and medical afflictions, of which Smollett says:

> Having considered these effects of the Warm Bath, consisting of pure Water only, I am inclined to believe that the Mineral Principles in Hot Springs, have often, in the cure of patients by Bathing, usurped that praise and reputation which was really due to the simple element; and that the external use of common Water, properly warmed, would have the same, or nearly the same, effect in the gout, which an ingenious physician attributes to the *saponaceous* and *sulphureous* Particles with which the Waters of Bath are impregnated.

The Essay is preceded by a most interesting Introduction by Claude E. Jones, which is a valuable contribution to our knowledge of Smollett's medical life. Smollett was intimate with the Hunters and many other distinguished medical men. He contributed to Dr. Smellie's "Collection of Cases and Observations in Midwifery," and prepared Smellie's work on midwifery for the press. The Introduction also contains much valuable information on Smollett's career as a surgeon and physician. Curiously enough he seems to have abandoned medicine for literature shortly after receiving his degree of M.D. from Glasgow in 1750, having actually practiced for a number of years before.

Disease, Gadfly of the Mind, Especially the Stimulus of Skin Diseases on the Development of the Mind. The Prosser-White Oration before the St. John's Hospital Dermatological Society, June 27, 1934. By William Allen Pusey, M.D. London, H. K. Lewis and Co., Ltd., 1935.

As Socrates contended that his activities as an intellectual gadfly had been his chief service to the Athenians, so Dr. Pusey contends that disease, pain and suffering have been of the utmost importance to the human race by stimulating man's mental activities to work out means to overcome them. "From Egypt and Babylonia to Greece, from Imhotep to Hippocrates, we find medicine one of the chief concerns of the mind." Dr. Pusey contradicts the frequent assumptions that the biological sciences and medicine have lagged behind the other physical sciences, asserting on the other hand "that medicine from the beginning of history to the present time has been a leader, or even the leader." He then goes on to show that from the earliest times the manifestations of morbid processes on the skin have been among the most studied of pathological conditions, quoting many recorded instances to prove his point, he carries his argument down to the modern period with its studies of infection and immunity, allergy and metabolism.

Dr. Pusey certainly makes out a good case and his book is well worth reading as a stimulating contribution to a most interesting phase in the history of civilization.

ONE HUNDRED AND FIFTY YEARS OF PUBLISHING, 1785–1935. Lea and Febiger, Philadelphia. 1935.

There are few business firms in the United States that can boast one hundred and fifty years of continuous existence and fewer still in which direct descendants of the founder are still active in the direction of its affairs. The firm of Lea and Febiger having rounded out one hundred and fifty years with this proud distinction have issued a delightful little history of the house. It was founded in 1785 by Matthew Carey, an Irish political refugee, who on a previous occasion had fled to Paris where he had made the acquaintance of Lafayette and Benjamin Franklin. When he came to America Lafayette, who was then in the United States, advanced him four hundred dollars, with which Carey started a publishing business, which was successful from the outset. He published several periodicals and many books, besides writing several important contributions to literature himself, among them his celebrated account of the epidemic of yellow fever in Philadelphia in 1793. He published also the more famous, but not so reliable, "Life of Washington," by Weems. In 1820 the firm began the publication of the *Philadelphia Journal of the Medical and Physical Sciences*, which under the name of the *American Journal of the Medical Sciences* which it was given in 1827, continues to the present day as one of the best known medical journals in the English language. About the middle of the nineteenth century the firm began confining its business solely to medical and scientific books. Besides Mathew Carey there have been several of his descendants who while managing the affairs of the firm have also acquired distinction in other fields. His son-in-law, Isaac Lea, was a foremost geologist and conchologist, at one time president of the Academy of Natural Sciences of Philadelphia, and his son, Henry C. Lea, was the author of many historical works of permanent value. In 1880 Christian C. Febiger, a relative of the Lea family who had been working in the business many years, became a partner.

This little book, which contains much really valuable historical information on the medical profession in Philadelphia, is tastefully got up, with many handsome illustrations and interesting facsimiles.

A HISTORY OF EMBRYOLOGY. By Joseph Needham, SC.D. Fellow of Gonville and Caius College, Sir William Dunn Reader in Biochemistry in the University of Cambridge. Cambridge University Press, 1934.

This book is based on a course of lectures given by the Author at the University of London in 1931. These were published as a monograph entitled, "Speculation, Observation, and Experiment, as illustrated by the History of Embryology," in the same year. They are here republished with very considerable amplification. Dr. Needham has well fulfilled his declared purpose of laying bare the roots of chemical embryology and continuing its history down to modern times, but he has done much more, because he has written the history of morphological and physiological embryology from the earliest days down to the beginning of the nineteenth century, when, as he says, the increased number and great variety of problems in embryology have become so great that it is necessary to leave them for further consideration.

From the time of Hippocrates, curiosity as to what went on in an egg to result in the formation of a living creature led to examinations of the contents of eggs from one period of gestation to another, and thus was laid the foundation for the future science of embryology. It is impossible to review in detail the immense accumulation of facts and the depth of study which Dr. Needham has bestowed on every phase of the subject from Chapter I, which deals with "Embryology in Antiquity," beginning with a great deal of not generally known matter concerning the embryology of India and Egypt, and continuing down to the really scientific work of Aristotle and Galen. Chapter II is rather sad reading, covering the subject from Galen to the Renaissance as misunderstood by Patristic, Jewish and Arabian pseudoscience with the true but sad reference to its "lowest depth" which was achieved in the writings of Hildegarde, the Abbess of Bingen. In this connection he reproduces after Singer a picture from her writings illustrating the descent of the soul into the embryo from heaven. The period ends with adequate tribute to the famous anatomical studies of Leonardo da Vinci in his notebooks. In Chapter III Dr. Needham gives a splendid description of the labors of Harvey, Malpighi, Walter Needham, Highmore, Gassendi and others who brought real scientific methods to bear on their researches, unfortunately sometimes drawing false conclusions such as those of Malpighi, which led to the development of preformationism and other erroneous conceptions. The last chapter deals with the work and speculations of Boerhaave, von Haller and others, and the theories such as ovism versus animalism, preformation versus epigenesis, which occupied so much intellectual effort in the eighteenth century.

It is very difficult in a short review to do adequate justice to such a truly great and original contribution to the history of science. Its importance to the research worker as well as the historian can not be overestimated. The large number of illustrations which accompany the text have evidently been selected with great care and judgment and, therefore, are of real use. The book concludes with a most inclusive and valuable bibliography and an excellent index.

A History of Magic and Experimental Science. Vols. III and IV. The Fourteenth and Fifteenth Centuries. By Lynn Thorndike, Professor of History in Columbia University. N. Y., Columbia Univ. Press, 1934.

Those who have read Professor Thorndike's two previous volumes, "A History of Magic and Experimental Science during the First Thirteen Centuries of Our Era" have looked forward with eager anticipation to their continuation and these new volumes fully answer all expectations. Although astrology, alchemy and other occult arts still occupy dominant positions in what must be termed the scientific writings of the fourteenth and fifteenth centuries, nevertheless, the evidence adduced by Professor Thorndike shows conclusively the dawning of true experimental science. It is curious that in many respects this scientific awakening is more evident in the fourteenth than in the fifteenth century and that enlightened humanists, such as Poggio and Politian, were thoroughly imbued with a belief in astrology and other forms of occultism. Cardinal Nicholas of Cusa, one of the best physicists and mathematicians of the fifteenth century, practiced and believed in astrology, and Aeneas Sylvius, later pope Pius II, believed that rulers should have at least some knowledge of astrology and ascribes the discord in the council of the church in 1437 to the influence of Mars. Dr. Thorndike's present work goes no further than 1500 but it is curious to reflect that astrological practices seem to have prevailed to almost as great extent during the following century. Thus he gives an interesting account of Jean Ganivet and describes his book, "Amicus medicorum," written in 1431, which was a manual of astrological medicine for the use of physicians. This work was printed in, at least, five different editions, the last at Frankfurt in 1614. Of particular interest to those interested in the history of medicine are the passages dealing with some distinctly medical works by authors whose names and writings are known to us. Peter of Argellata's book on surgery was composed probably in the first fifteen years of the fifteenth century, and appeared in printed editions into the sixteenth century. Thorndike quotes from it to show Peter's belief in occult influences. Antonio Benevieni, of Florence, is frequently referred to as the founder of pathological anatomy. Professor Thorndike does not attach quite as much importance to Benevieni's book as do most of those who have written of it, possibly without studying as carefully as he has done. He points out that his clinical reports merely continue the tradition of the *consilia* of older writers, and he thinks his autopsy reports only attest the fact that such examinations were a rather common practice at that period, but he does give him credit for originality in his method of recording them. Thorndike uses the work of Benevieni to point to the fact which he emphasizes elsewhere, whereas, early printed books are available, manuscripts are not so easily studied, consequently, historians have been apt to overemphasize the importance of such books and neglect the works in manuscript which immediately preceded them. The first works to appear in print were important events possibly in the history of printing, but in many instances from the viewpoint of the history of science were inferior to earlier works in manuscript.

Professor Thorndike's four volumes constitute an invaluable mass of material and throw a new light on many obscure points in the history of science. The delightful manner in which he presents his material makes a continuous story of the progress of science from mysticism and magic to experimental method and research. They should lead to a revision of much that appears as history in the general histories of medicine, and will make it more than ever apparent that the only safe approach to the subject is by careful study of the original sources.

JOURNAL OF TECHNICAL METHODS AND BULLETIN OF THE INTERNATIONAL ASSOCIATION OF MEDICAL MUSEUMS. No. XIV. Editor, Maude E. Abbott, M.D., McGill University, Montreal, March, 1935.

The present issue of this Journal and Bulletin contains in addition to many important scientific contributions, several obituary notices of some notable workers in the field it covers, including Drs. William H. Welch, Ernest Scott and J. F. Coupal.

Of interest to medical historians is a very full abstract of the report on the ancient anatomical collections in the University of Leyden, which was published in *Janus*, September and October, 1934. The collections originating with Rau (1705–1719) at the commencement of the eighteenth century and continued by Albinus, van Doeveren, Brugmans, Bonn and the Sandiforts, after many years of neglect have been salvaged, classified and fixed up by Professor J. A. C. Barge and Dr. C. J. van der Klaauw, and show many points of remarkable interest. One specimen of a child's head beautifully injected, and labelled Ruysch, is believed to be the only specimen prepared by Ruysch that remains in Holland, all the collections of that great anatomist having been sold to Russia. For those who have not access to the original abstract of the report in *Janus* this abstract by Dr. Abbott will be most welcome.

MOHAMMED UND DIE MEDIZIN NACH DEN UEBERLIEFERUNGEN. By Dr. Wassel Rassian. Berlin, Emil Ebering, 1934.

Arabian medicine from about the year 1000 on until the end of the twelfth century is fairly well known, at least relatively to the period corresponding to the life of the founder of Islamism. In the western world knowledge of Mohammed's attitute towards medicine is exceedingly meager, hence this little brochure is most welcome for it gives valuable information on Mohammed's ideas about medicine and about his hygienic commandments. For his time

Mohammed had considerable medical knowledge which is embodied in the Koran and in the writings of his disciples. Some of his ideas are, it is true, very primitive. He says in answer to the question, how was man made? "Out of the seed of man and the seed of woman; that of man is tough and firm and from it are formed the bones and nerves; the seed of woman is thin and soft and from it the flesh and blood are made. Disease is a punishment or a test sent by God. Many diseases are due to improper diet, especially to gluttony. Mohammed himself suffered much from headache; he is also said to have had epilepsy, but no mention of this is made in the present monograph. He cured his attacks of headache by wrapping the head tightly and applying wet cups to the top. Much is said in Arabian writings of frustrated love as a disease. Mohammed advised youth to marry soon after puberty, otherwise to fast, as that was soothing to the nerves. Against impotence he recommended the abundant use of eggs.

Nose bleed should be checked only if it had lasted too long or had weakened the body—an interesting bit of clinical acumen. In dropsy Mohammed advised puncture, which is still one of the most efficacious procedures. To an Arab who asked what he should say at the end of every prayer the Prophet replied, "Pray to God for health."

Mohammed introduced fasting into his ritual, evidently with two ends in view:

1. The ethical or religious one that the rich should experience the same sensation of hunger as the poor man and should thereby be induced more readily to give alms.

2. A hygenic one; namely to give the stomach and bowels a rest. He chose Ramadan, the holy month for the fast and did not allow his followers to eat before sunset. Although water was scarce in Arabia and Yemen, Mohammed ordered the washing of hands and feet before and after meals. Circumcision was a commandment of the so-called second order, that is it is not mentioned in the Koran. It is usually carried out between the third and eighth years. For the purpose of confession of faith five conditions are required: Circumcision, shaving, pulling out the axillary hairs, cutting of the nails, pointing the beard.

Mohammed vigorously condemned extramarital sexual relations and prostitution; these were to be punished severely on earth and in the hereafter. It is evident that many of Mohammed's hygienic rules were borrowed from the Mosaic code or were adopted in part from the practices of neighboring nations, Greek and Persian.

As there is a definite interest today in Arabian science, including medicine, further knowledge of a people who exercised a decisive influence on European culture in the Middle Ages should be forthcoming.

DAS GIFTBUCH DES SANAQ, EINE LITERATURGESCHICHTLICHE UNTERSUCHUNG. By Bettina Strauss, Berlin, Julius Springer, 1934.

Bettina Strauss has prepared a translation of the famous book on poisons of Sanaq. The work is derived from Indian and Greek sources and consists of five codices of which Strauss has made use of four—those of Cairo, Berlin, Constantinople and Bagdad. Although Sanaq's work has chiefly historical value, it is important to know as much as possible of Arabian medicine on account of its undisputed influence on the development of medicine in Western Europe. The brochure contains the Arabic text as well as the translation.

MEDIZINGESCHICHTLICHES BEI NOVALIS. By Karl Theodor Bluth. Berlin, Emil Ebering, 1934.

Novalis, whose real name was Friedrich Freiherr von Hardenberg, was born in 1772 of an ancient family which even in the thirteenth century called itself de Novali. Coming early under the influence of the Romantic School, he rapidly rose to be the chief representative of that short-lived movement. Illness and contemplation of death gave him an interest in medicine—he studied the prevailing systems and new discoveries in search for a unifying principle in medicine. The Brunonian system which the Germans had adopted with more eagerness than Brown's own compatriots appealed particularly to his mind. As a product of the Romantic movement his writings are interesting to the student of literature rather than to the student of medicine. Novalis died of consumption in 1801 at the early age of twenty-nine.

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